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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5

230 SOUTH DEARBORN ST.

CHICAGO, ILLINOIS 60604

REPLY TO THE ATTENTION OF:

5SMQA

MEMORANDUM

DATE: MAY 15 1990

SUBJECT: Approval of the First Revision, State-Lead Quality Assurance Project Plan for the Operable Unit Activity at the Southeast Rockford Groundwater Contamination Site in Rockford, Illinois

FROM: Valerie J. Jones  
Regional Quality Assurance Officer (5SMQA)

TO: Jodi Traub, Acting Chief  
Superfund Program Management Branch (5HS)

ATTENTION: Karen Yeates, Project Officer  
Illinois/Indiana Unit

I am providing approval of the first revision, State-Lead Quality Assurance Project Plan (QAPjP) for the operable unit activities at the Southeast Rockford Groundwater Contamination site in Rockford, Illinois, which was received by the Quality Assurance Section (QAS) on May 7, 1990, (QAS Log-In No. 1223).

Please note that, to facilitate this subject QAPjP for approval, QAS staff has made the following corrections:

1. In 3 of 9, a sentence, "The existing geological information, site history, and previous investigations are described in Section 2.0 of the Work Plan." is added to the second paragraph.
2. In Section 3.4 (Sampling Network), a sentence, "Samples will be collected over a period of two weeks." is added.
3. In page 6 of 9, "level 5" in the third paragraph is changed to "DQO Level V".
4. In Section 4.3.5 (Project Organization and Responsibility), a sentence, "Central Regional Laboratory (CRL) will train the Camp Dresser and McKee Inc. (CDM) Data reviewer prior to the start of the field work." is added.

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5. In Section 14.1.6 (Data Reduction, Validation, and Reporting), a sentence is added to specify that data reporting will be in accordance with Contract Laboratory Program (CLP) SOW-2/88 for organics, SOW-7/88 for inorganics, and SASs in Appendix B.
6. In Appendix B, the following are changed:
  - a. SAS for Metal Analysis
    - o A sentence, "The results shall be reported down to the Method Detection Limit (MDL) and flagged with "J" " is added to the Item #9.
    - o In Attachment III, the "CLP SOW-7/85" is changed to "CLP SOW-7/88".
  - b. SAS for the Analysis of Volatile Organics
    - o A sentence, "The results shall be reported down to the MDL and flagged with "J" " is added to Item #9.
    - o The last three sentence of Item #7 are revised to read, "The continuing calibration check standard shall contain all nine (9) target compounds. If percent difference of any compound of the continuing calibration check standard is greater than 25%, then corrective action shall be taken. The minimum relative response factor (RF) for each target compound shall be greater than 0.150."
    - o In Item I, "Attachment IV" is changed to "Attachment I".
7. In the Sampling and Analysis Plan (SAP), the following changes are made in Section 1.3 (page 4 of 5):
  - a. "204 samples" is changed to "189 samples".
  - b. A sentence, "Samples will be collected over a period of two weeks." is added.

A copy of these corrected pages is included for your use. They shall be incorporated into the finalized QAPjP.

The original signature page is included. We have retained two copies of this subject QAPjP for CRL's and our records. We would like to receive a copy of the completed signature page when it is available.

## 1.0 TITLE PAGE

### QUALITY ASSURANCE PROJECT PLAN OPERABLE UNIT SOUTHEAST ROCKFORD SITE ROCKFORD, ILLINOIS

MAY 1990

Approved By: \_\_\_\_\_  
USEPA Region V  
Remedial Project Manager

Date: \_\_\_\_\_

Approved By: *David J. Jones*  
USEPA Region V  
Quality Assurance Office

Date: *5/15/90*

Approved By: \_\_\_\_\_  
USEPA Region V  
Illinois Project Officer

Date: \_\_\_\_\_

Approved By: \_\_\_\_\_  
Illinois EPA  
Project Manager

Date: \_\_\_\_\_

Approved By: \_\_\_\_\_  
Illinois EPA  
Quality Assurance Office

Date: \_\_\_\_\_

Reviewed By: *[Signature]*  
USEPA Region V  
Director, Central  
Regional Lab

Date: *5/16/90*

Approved By: \_\_\_\_\_  
Camp Dresser & McKee Inc.  
Project Manager

Date: \_\_\_\_\_

Approved By: \_\_\_\_\_  
Camp Dresser & McKee Inc.  
QA/QC Manager

Date: \_\_\_\_\_

FILE COPY

QUALITY ASSURANCE BRANCH

MAY 07 1990

ENVIRONMENT SERVICES DIVISION

SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION  
OPERABLE UNIT QUALITY ASSURANCE PROJECT PLAN

PREPARED FOR:

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY  
DIVISION OF LAND POLLUTION CONTROL  
REMEDIAL PROJECT MANAGEMENT SECTION  
FEDERAL SITE MANAGEMENT UNIT  
2200 CHURCHILL ROAD  
SPRINGFIELD, ILLINOIS 62794-9276

MAY 1990

QUALITY ASSURANCE BRANCH

MAY 07 1990

ENVIRONMENT SERVICES DIVISION

PROJECT NO: 1681-3-CG-GEAD

16814/02.1

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## LIST OF ACRONYMS

CDM	Camp Dresser & McKee
CLP	Contract Laboratory Program
CRL	USEPA Central Region Laboratory
CRQL	Contract Required Quantitation Limits
EMSL	Environmental Measurements System Laboratory (USEPA)
FM	Field Manager
FS	Feasibility Study
HSP	Health and Safety Plan
IDPH	Illinois Department of Public Health
MCL	Maximum Contaminant Level
OVA	Organic Vapor Analyzer
PRS	Proposed Illinois Groundwater Quality Standards
QAC	Quality Assurance Coordinator
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RAL	Remedial Action Level
RAS	Routine Analytical Services (CLP)
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RPM	Remedial Project Manager (USEPA)
RPO	Regional Project Officer (USEPA)
RSCC	Regional Sample Control Coordinator
SAP	Sampling and Analysis Plan
SAS	Special Analytical Services (CLP)
SDWA	Safe Drinking Water Act
SIPM	Site Investigation Procedures Manual
SM	Site Manager
SMO	Sample Management Office
SOP	Standard Operating Procedure
SOW	Statement of Work

**LIST OF ACRONYMS**  
**(Continued)**

TAL	Target Analyte List
TAT	Technical Assistance Team
TCL	Target Compound List
USEPA	U.S. Environmental Protection Agency
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compounds
WA	Work Assignment

### 3.0 PROJECT DESCRIPTION

The Remedial Investigation portion of the Operable Unit is designed to gather specific information necessary to determine if the site presents a hazard to human health, welfare or the environment and to evaluate feasible remedial alternatives and/or the need for additional studies.

#### 3.1 STUDY AREA BACKGROUND

The area of concern is located near Southeast Rockford in Winnebago County, and consists of approximately 2 to 3 square miles in Sections 1, 2, and 3, T43N, R1E and Section 6, T43N, R2E. The study area is bounded by Harrison Avenue to the north, Sandy Hollow to the south, the north-south center line of Section 6 to the east, and the Rock River to the west. The study area is shown in Figure 3-1.

The study area is predominantly an urban residential area that includes scattered retail and commercial operations. A small industrial park is located near the eastern boundary of the study area in the vicinity of Laude Drive. The study area is predominantly flat-lying and slopes gently westward toward the Rock River, but locally contains low-relief hilly areas. Maximum topographic relief across the study area is approximately 120 feet. A small concrete-lined drainage ditch runs across the study area and discharges to the Rock River at the southwestern corner of the study area. A review of 117 Illinois Department of Public Health (IDPH) well construction reports indicated that the majority of the residential wells in the study area are screened in the 40-foot to 70-foot depth range in a sand and gravel aquifer. Although deeper residential wells are common in the study area, no systematic distribution of the deeper wells is evident.

The well construction reports reviewed were generally incomplete regarding stratigraphy and well construction information. The Southeast Rockford Phase I Remedial Investigation is currently in the planning stage and is



Southeast Rockford

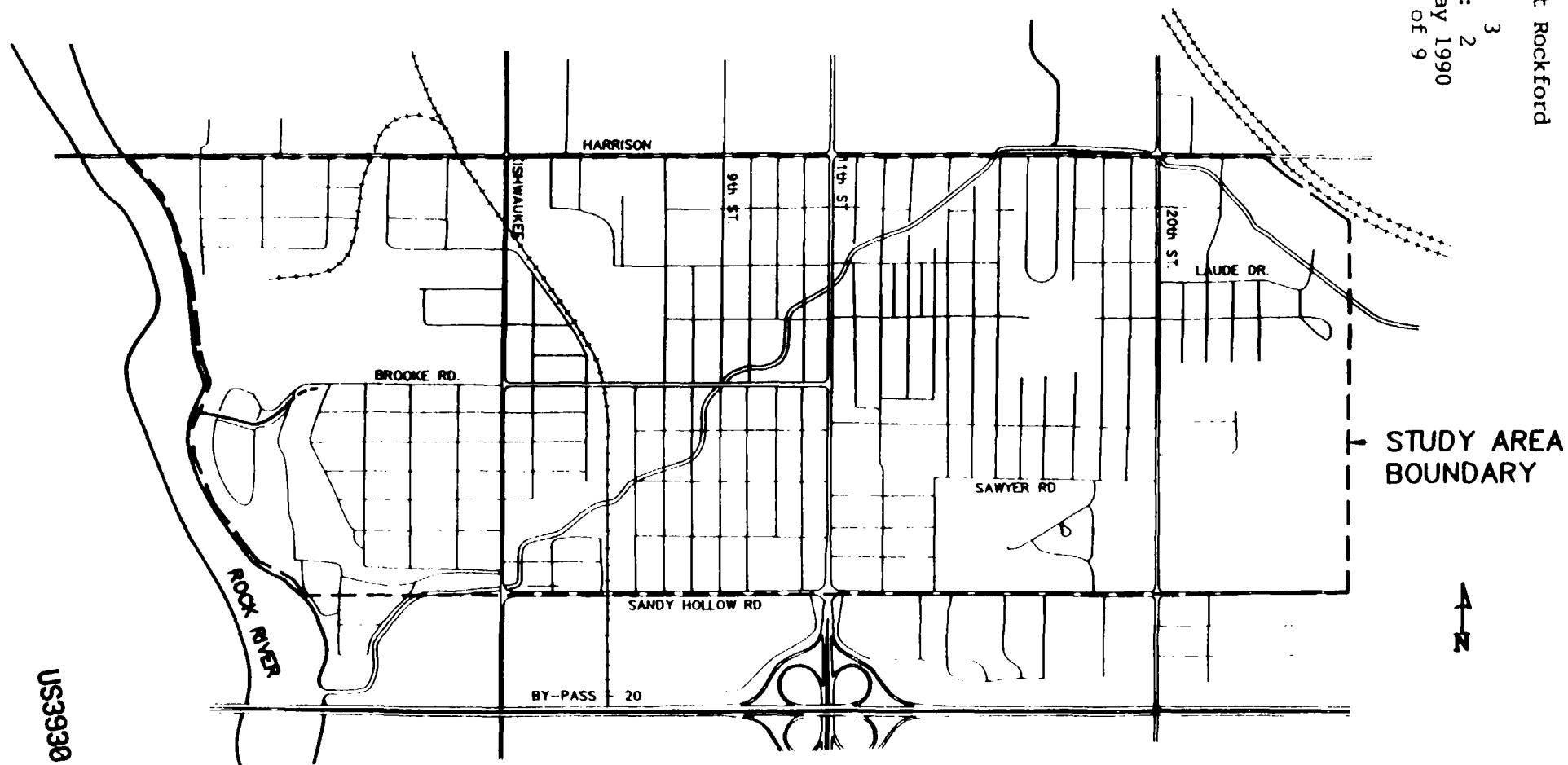
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**CDM**

environmental engineers, scientists,  
planners, & management consultants

SCALE

0 0.5 MILES

**SOUTHEAST ROCKFORD  
STUDY AREA**

FIGURE NO.

**3-1**

designed to address area hydrogeologic information that is not addressed in this study. Information on well construction of the wells sampled will be gathered as part of this Operable Unit residential well sampling.

A summary of the existing geologic information, site history, and previous investigations is provided in the Work Plan. Appendix A of this QAPP contains a summary of the more recent (1988 and 1989) existing analytical data from previous sampling events. Based on the existing data, the following volatile organic compounds (VOCs) and metals have been targeted as contaminants of concern:

Trichloroethylene (TCE)  
1,1,1-Trichloroethane (1,1,1-TCA)  
Cis-1,2-Dichloroethylene (Cis-1,2-DCE)  
Trans-1,2-Dichloroethylene (Trans-1,2-DCE)  
1,1-Dichloroethylene (1,1-DCE)  
Tetrachloroethylene (PCE)  
1,1-Dichloroethane (1,1-DCA)  
1,2-Dichloroethane (1,2-DCA)  
Vinyl Chloride  
Lead  
Cadmium  
Chromium  
Arsenic

Of the contaminants listed above, Safe Drinking Water Act Maximum Contaminant Levels (MCLs) exist for the metals and TCE, 1,1,1-TCA, 1,1-DCE and 1,2-DCA. MCLs have been proposed for cis-1,2-DCE and PCE. Twelve of the above contaminants have been addressed in the Proposed Illinois Groundwater Quality Standards, the exception being 1,1-DCA. These compounds (except vinyl chloride) have been detected in the Southeast Rockford area and some have been found consistently at or above 50% of the MCL.

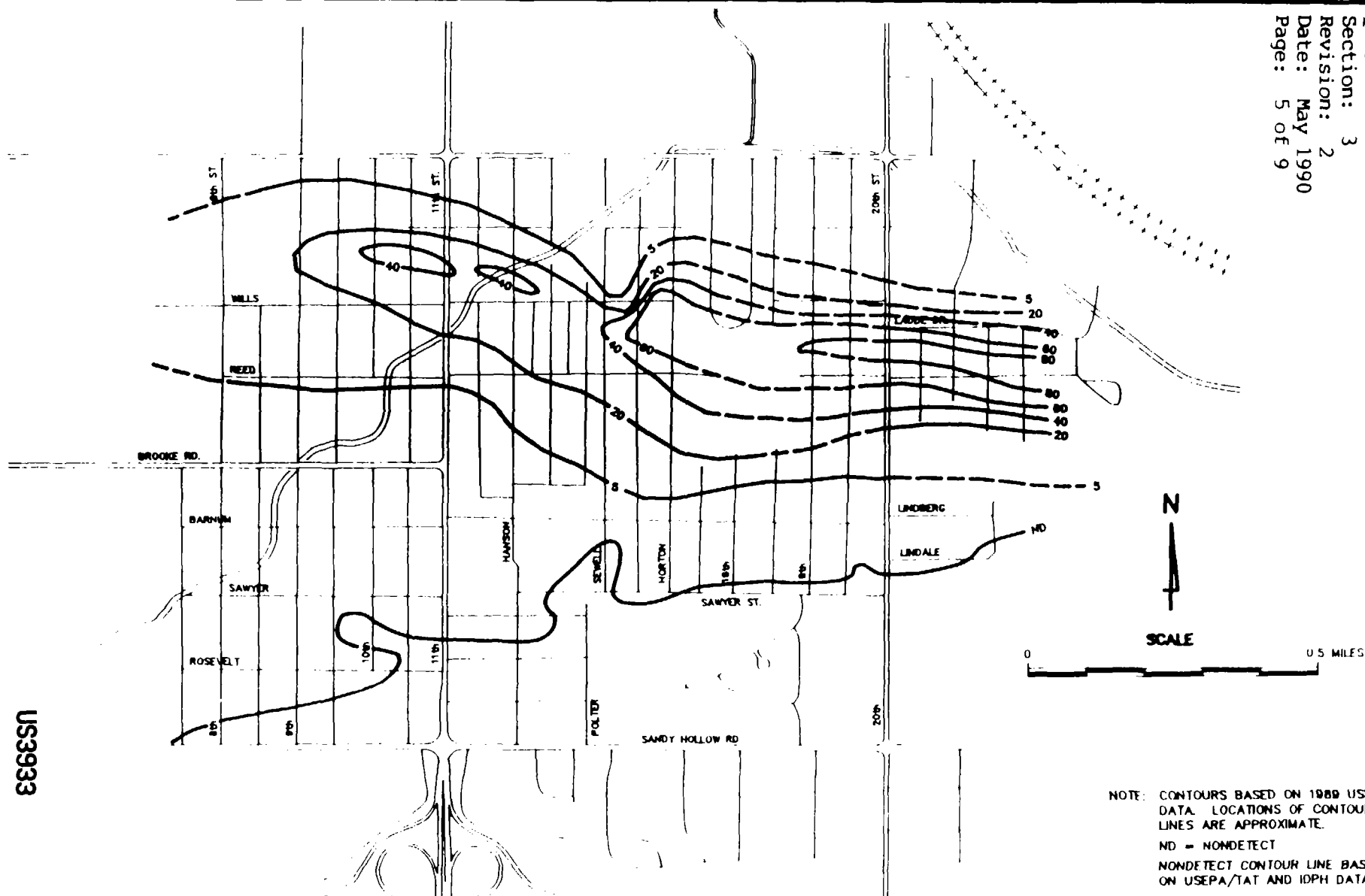
Most of these chemicals are products of each other through microbial degradation by sequential dehalogenation. TCE is an end product of PCE, cis-1,2-DCE is a degradation product of PCE, TCE, and 1,1,1-TCA; and 1,1-DCE is a final product of 1,1,1-TCA. (See Data Summary in Appendix A for further information.) Because these compounds are found at the site and are degradation products of one another, they can be used to help determine the source of contamination and are useful in providing insight into the fate and transport of the contamination. The VOCs that will be analyzed in the Operable Unit are those previously listed. Vinyl chloride is included because it is a possible degradation product, along with some of the other contaminants of concern.

The approximate area affected by the plume of VOC-contaminated groundwater based on the 1989 USEPA/TAT data, is shown with a plume concentration for TCE in Figure 3-2. Although the VOC plume contains other components in addition to TCE, TCE has been chosen as an indicator parameter to illustrate the general distribution of VOC-contaminated groundwater at the site. Review of USEPA/TAT data indicates that the other VOC contaminants in the study area have the same general distribution as the TCE plume shown in Figure 3-2.

Metals have been analyzed in only a limited number of samples in the Southeast Rockford Operable Unit study area (Data Summary, Appendix A). Chromium was detected during a 1984 investigation of illegal disposal activities in a well located near a metal plating company. Cadmium, arsenic and lead were detected during an IEPA routine sampling event in 1988 near Barrett's Mobile Home Park at Harrison and Marshall. Due to the fact that metals (primarily those listed) have been detected in all previous samples that were analyzed for metals, all of the samples collected from the study area will be analyzed for cadmium, chromium, lead and arsenic at Drinking Water Detection Limits.

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**CDM**

environmental engineers, scientists,  
planners, & management consultants

**TCE CONCENTRATION  
IN PRIVATE WATER WELLS  
(In ug/l)**

FIGURE NO.

**3-2**

### 3.2 PROJECT OBJECTIVES AND DATA USAGE

The overall objective of this **Operable Unit** investigation is to determine which residences and industries **outside** the Removal Action area are affected or potentially affected by the groundwater contaminant plume and to develop and evaluate a **cost-effective** alternative for providing potable water to affected residents in a **timely** manner. In order to achieve this objective CDM will conduct **residential**, municipal and industrial well sampling. The data obtained from this sampling will be used in conjunction with existing USEPA/TAT and IDPH data to identify those residential and industrial wells in the study area that are contaminated at levels between the MCLs and method detection limits for the contaminants of concern.

In order to maximize data coverage, CDM's sample locations are concentrated outside of the known VOC plume area as defined by existing 1988 and 1989 data (areas that were not sampled during previous studies). Because there is very little existing metals data for the study area, no metals plume definition is possible at this time. Therefore, all samples collected will also be analyzed for the list of target metals previously discussed.

All sampling for this project will be from residential, industrial or municipal wells to evaluate the need for and extent of alternate water supply alternatives. The analytical data produced will be used for risk assessment and development, evaluation and design of alternatives. In order to allow for comparison of the data with applicable regulatory requirements (Safe Drinking Water Act Maximum Contaminant Levels) and human health criteria, DQO Level V, Special Analytical Services analyses are necessary for both metals and volatile organics to achieve detection limits that will allow for these comparisons. The Special Analytical Services requests for these analyses are contained in Appendix B.

### 3.3 SCHEDULE

The anticipated schedule for **key activities** in this Operable Unit is shown in Figure 3-3.

### 3.4 SAMPLING NETWORK

The scope of sampling for this **Operable Unit** includes the collection and analysis of 144 residential **well samples**, 10 industrial well samples and one municipal well sample for **target metals** and target volatile organics. Seventeen field duplicate **samples** and seventeen field blank samples will also be collected and analyzed for target metals and target volatile organics. One volatile organic trip blank will be shipped with each cooler of volatile organics. It is **estimated** that 15 trip blanks will be collected.

Table 3-1 is a summary of the **sampling** and analysis network and specifies the parameters to be measured, the number of samples to be collected, and the level of QC effort for **each sample type**.

All sampling and testing will **conform** to guidelines set forth in the User's Guide to the EPA Contract **Laboratory Program**. Sections 6 through 9 of the QAPP and Section 3 of the **Sampling and Analysis Plan** discuss the specific sampling and analytical **procedures** to be followed for this project. Section 2 of the **Sampling and Analysis Plan** describes sample locations and rationale.

Samples will be collected over a period of two weeks.

**FIGURE 3-3**  
**SCHEDULE OF OPERABLE UNIT ACTIVITIES**

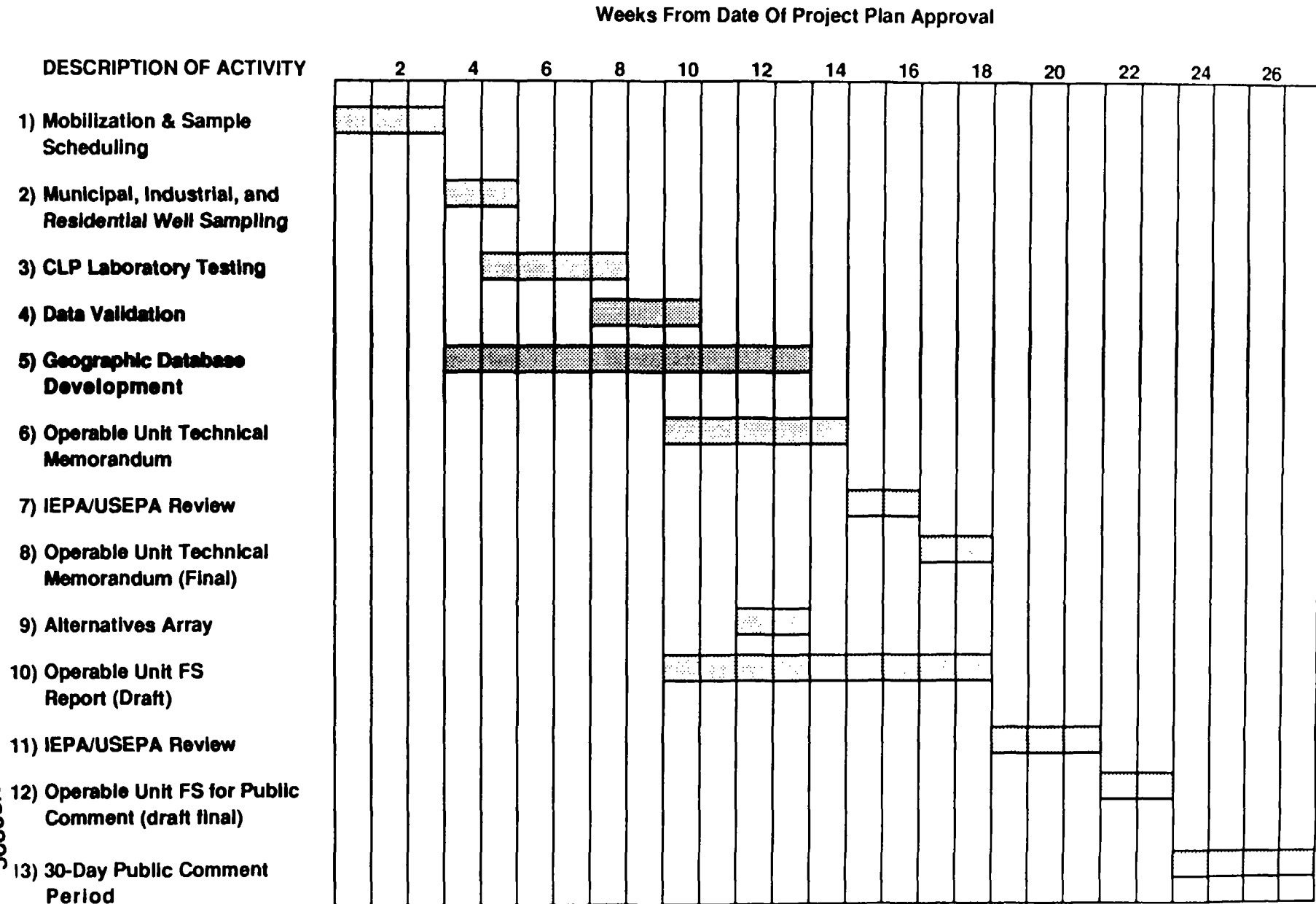


TABLE 3-1  
SUMMARY OF SAMPLING AND ANALYSIS PROGRAM

Sample Matrix	Field Parameters	Laboratory Parameters	QA Samples									Matrix
			Investigative Samples			Field Duplicate			Field Blank			
			No.	Freq	Total	No.	Freq	Total	No.	Freq	Total	Total
Residential Wells	pH, Specific Conductance, Temperature	SAS for volatile <sup>1/</sup> organics from CLP	144	1	144	15	1	15	15	1	15	174
		SAS for metals <sup>1/</sup> from CLP	144	1	144	15	1	15	15	1	15	174
Municipal Supply Well	pH, Specific Conductance, Temperature	SAS for volatile <sup>1/</sup> organics from CLP	1	1	1	1	1	1	1	1	1	3
		SAS for metals <sup>1/</sup> from CLP	1	1	1	1	1	1	1	1	1	3
Industrial Wells	pH, Specific Conductance, Temperature	SAS for volatile <sup>1/</sup> organics from CLP	10	1	10	1	1	1	1	1	1	12
		SAS for metals <sup>1/</sup> from CLP	10	1	10	1	1	1	1	1	1	12

A trip blank will be included with each shipment of volatile organic samples. An estimated 15 trip blanks will be required.

One sample out of every 20 (or portion thereof) will be collected as a matrix spike duplicate sample.

<sup>1</sup>CLP SAS volatile parameters are listed in Table 5-1 of the QAPP and in the SAS Request.

<sup>2</sup>CLP SAS metal parameters are listed in Table 5-2 of the QAPP and in the SAS Request.

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#### 4.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Camp Dresser and McKee Inc. (CDM), as prime contractor, has overall responsibility for all phases of the Operable Unit and will therefore oversee the field investigations, prepare the Technical Memorandum and conduct a Feasibility Study. CDM will also provide QA/QC for all deliverables and provide for their issuance.

##### 4.1 PROJECT ORGANIZATION

The project organization structure, Figure 4-1 shows the staff designations, assignments and lines of communication for the Operable Unit.

##### 4.2 IEPA PERSONNEL

###### 4.2.1 PROJECT MANAGER

The Project Manager, Mr. David Dollins, is responsible for overall management and coordination of technical and fiscal aspects of the Operable Unit. Mr. Dollins will serve as the IEPA contact for the USEPA Region 5 Project Manager.

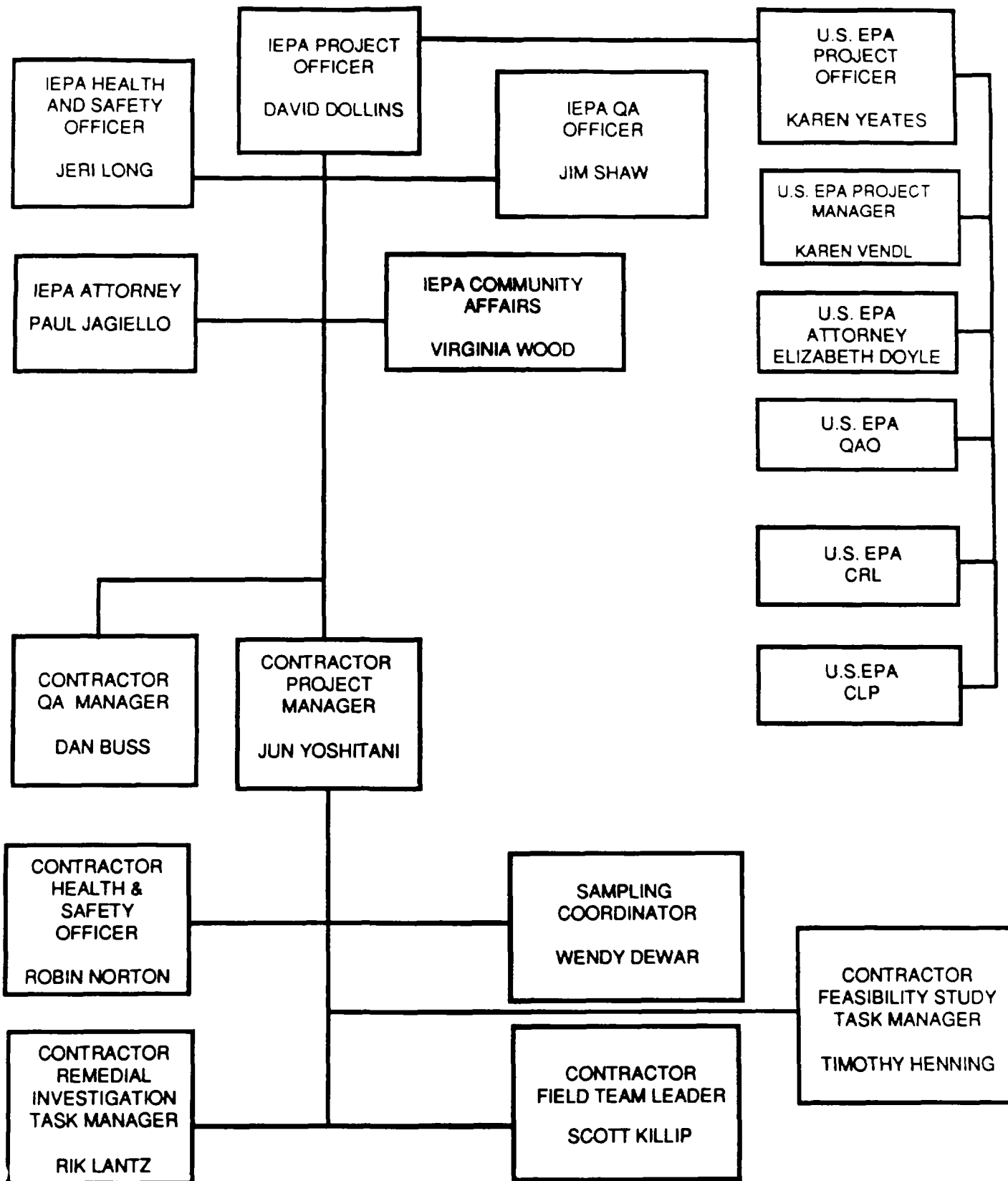
###### 4.2.2 ATTORNEY

The Attorney, Mr. Paul Jagiello, is responsible for the legal aspects of the Operable Unit including site access and other legal issues that may arise.

###### 4.2.3 QUALITY ASSURANCE OFFICER

The Quality Assurance Section Project Officer, Mr. Jim Shaw, is responsible for the QAPP technical review. Mr. Shaw is available for consultation on various QA/QC issues.

# FIGURE 4-1 SOUTHEAST ROCKFORD OPERABLE UNIT ORGANIZATION CHART



#### 4.2.4 HEALTH AND SAFETY OFFICER

The Health and Safety Officer, Ms. Jeri Long, is responsible for the review of the Health and Safety Plan.

#### 4.3 USEPA PERSONNEL

##### 4.3.1 STATE PROJECT OFFICER

The USEPA State Project Officer, Ms. Karen Yeates, is responsible for federal oversight of state-lead activities for the state of Illinois.

##### 4.3.2 REMEDIAL PROJECT MANAGER

The USEPA Region 5 Remedial Project Manager, Ms. Karen Vendl, is responsible for oversight of the entire Operable Unit at Southeast Rockford.

##### 4.3.3 QUALITY ASSURANCE SECTION

The USEPA Region 5 Quality Assurance Section (MQAB/ESD) is responsible for review and approval of the QAPP.

##### 4.3.4 LABORATORY TESTING ASSIGNMENTS

Liquid samples from residential, industrial and municipal wells will be analyzed by the laboratory described below:

- o USEPA Contract Laboratory Program (CLP) will analyze water samples at drinking water levels as part of the Special Analytical Services (SAS) package.

#### 4.3.5 LABORATORY QA/QC RESPONSIBILITIES

- o Contract Laboratory Program (CLP) Special Analytical Services (SAS)
  - Requests initiated by CDM Project Organization;
  - Requests coordinated through USEPA Region V Environmental Services Division or USEPA Region V Remedial Response Branch of USEPA Remedial Project Manager (RPM);
  - Review of SAS specifications - USEPA Region V QA Office and CRL; and
- \*\* - Final data review will be performed by Paul Patel and Bob Hank of CDM.

#### 4.3.6 REGIONAL SAMPLE CONTROL COORDINATOR

The USEPA Region 5 Regional Sample Control Coordinator (RSCC) will be the contact point for the scheduling of CLP, SAS analyses. The RSCC will be responsible for training the CDM Field Team Leader in the use of the USEPA CLP and its associated paperwork.

#### 4.4 CONTRACTOR PERSONNEL

CDM, as contractor to IEPA, will analyze the data generated by the Operable Unit field activities. CDM will be responsible for completion of tasks specified in the Statement of Work which includes the preparation of the Operable Unit Technical Memorandum.

##### 4.4.1 PROJECT MANAGER

The Project Manager is responsible for day-to-day management and coordination of the contractor staff. This duty includes, but is not limited to, ensuring that all contractor and subcontractor staff understand

\*\* Central Regional Laboratory (CRL) will train CDM data reviewer prior to the start of field work.

and comply with the QA/QC program. The Project Manager is responsible for the Work Plan and review of data generated from field measurements and activities. The Project Manager will also be responsible for preparing the Operable Unit reports.

#### 4.4.2 PROJECT QUALITY ASSURANCE MANAGER

The CDM Quality Assurance Manager is responsible for providing specific QA support to the Project Manager and coordinates QA technical operations among task teams performing duties that are assigned to CDM during this Operable Unit.

## 5.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide legally defensible results in a court of law. Specific procedures to be used for sampling, chain-of-custody, calibration, laboratory analysis, reporting, internal quality control, audits, preventive maintenance, and corrective actions are described in other sections of this QAPP. This section defines the goals for level of QA effort; accuracy, precision, and sensitivity of analyses; and completeness, representativeness, and comparability of measurement data from all analytical laboratories. (Refer to the glossary for definitions of these terms, Section 16.0.) Quality assurance objectives for field measurements also are also discussed.

### 5.1 REGULATORY AND LEGAL REQUIREMENTS

The data obtained from analysis of the residential, public and industrial wells will be compared to the National Primary Drinking Water Standards (NPDWS). The method detection limits specified in the Special Analytical Services Requests (Appendix B) from the CLP are sufficiently low to allow this comparison for the compounds of concern. The required detection limits for the target volatile organic and metals analysis are presented in Section 5.3.

### 5.2 LEVEL OF QUALITY CONTROL

Replicate samples, field blanks, and trip blanks consisting of distilled, deionized water will be submitted to the analytical laboratories to provide the means to assess the quality of data resulting from the field sampling program. Duplicate samples will be analyzed to check for sampling reproducibility. Generally, field precision control limits are 30% RPD for water samples. If this is exceeded, the field sampling techniques will be

reviewed to determine possible causes of the discrepancy. Sample data will not be rejected on the basis of field duplicate discrepancies. Blank samples will be analyzed to check for procedural contamination and/or ambient conditions at the site that may cause sample contamination. The general level of this QC effort will be one field duplicate and one field blank sample per group of 10 or fewer investigative samples, one matrix spike/matrix spike duplicate (MS/MSD) sample per group of 20 or fewer investigative samples, plus 1 trip blank sample per shipping cooler of VOA samples. Extra volume will be necessary for liquid organic samples targeted for MS/MSD analysis: triple the normal volume for VOA analysis. No extra volume is required for metals.

The specific level of field QC effort for the Southeast Rockford Operable Unit is described in Section 5.0 of the Sampling and Analysis Plan (SAP) and is summarized by sample matrix and parameter in Table 3-1 in Subsection 3.4 of this QAPP.

The residential, municipal and industrial well water samples collected at the site will be analyzed using the USEPA CLP. The level of laboratory QC effort for SAS analysis provided by the CLP is specified on the SAS request forms (Appendix B) for organic and inorganic analyses.

The QC level of effort for the field measurement of pH consists of pre-measurement calibration and a post-measurement verification using two standard reference solutions as outlined in Appendix C. QC effort for field conductivity measurements will include daily calibration of the instrument using standard solutions of known conductivity as outlined in Appendix C.

### 5.3 ACCURACY, PRECISION, AND SENSITIVITY OF ANALYSIS

The fundamental QA objective with respect to accuracy, precision, and sensitivity (see Glossary of Terms for definitions, Section 17.0 of laboratory analytical data is to achieve the QC acceptance criteria of the analytical protocols. The accuracy and precision requirements for SAS from

the CLP are specified in the **SAS** request forms (Appendix B). The sensitivities required for **SAS CLP analysis** are given for each compound in the **SAS** request forms and are provided in Table 5-1 for VOCs and in Table 5-2 for inorganic analysis.

The accuracy of field measurements of pH will be assessed through pre-measured calibrations and **post-measurements** which must each be within  $\pm 0.01$  pH units of the known **standard** buffer solution values. Precision will be assessed through **replicate** measures. (The electrode will be withdrawn, rinsed with **deionized water**, and re-immersed between each replicate. The calibration and **verification** will be done before the first replicate and after the last.) The instrument used will be capable of providing measurements to 0.01 **standard** unit. Accuracy of the conductivity meter will be assessed by a **daily** check of a standard solution. For field measurements of temperature, the accuracy of the thermometer will be checked in a water/ice slurry **once**, at the beginning of field activities. Calibration of field equipment will be performed in accordance with the calibration and maintenance **procedures** outlined in Appendix C.

#### 5.4 COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

It is expected that the CLP will provide data meeting QC acceptance criteria for 95 percent or **more of** all samples tested. The CLP laboratory should provide data that are **complete** and valid. (For definition of completeness, representativeness and comparability see Glossary of Terms, Section 17.0.)

The sampling network was **designed** to provide data representative of site conditions. During **development of** this network, consideration was given to past waste disposal practices, **existing** analytical data, physical setting and processes. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The **procedures used** to obtain the planned analytical data, as documented in this QAPP, are **expected** to provide comparable data. These



**TABLE 5-1**  
**QUANTITATION LIMITS FOR SAS VOC**  
**DRINKING WATER ANALYSIS**

<u>COMPOUND</u>	<u>METHOD DETECTION LIMIT (ug/l)</u>
Trichloroethylene	0.50
1,1,1 Trichloroethane	0.50
1,1-Dichloroethylene	0.50
Tetrachloroethylene	0.50
1,2-Dichloroethane	0.50
1,1-Dichloroethane	0.50
Vinyl Chloride	0.50
Cis-1,2-Dichloroethylene	0.50
Trans-1,2-Dichloroethylene	0.50

**TABLE 5-2**  
**INSTRUMENT DETECTION LIMIT**

<u>COMPOUND</u>	INSTRUMENT DETECTION LIMIT ug/l	
	<u>GFAA</u>	<u>ICP</u>
<u>Metal</u>		
1. Arsenic	2	
2. Cadmium	0.5	
3. Chromium		10
4. Lead	2	

new analytical data, however, may not be directly comparable to existing data because of differences in procedures and QA objectives.

#### 5.5 FIELD MEASUREMENTS

Measurement data will be generated in many field activities that are incidental to collecting samples for analytical testing or unrelated to sampling. These activities include, but are not limited to, the following:

- o Documenting time and weather conditions;
- o Locating and determining the elevation of sampling stations;
- o Determining pH and temperature of water supply;
- o Determining depths in a borehole or well; and
- o Verifying well development and pre-sampling purge volumes.

The general QC objective for such measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the intended use of the data through the documented use of standardized procedures. The procedures for performing these activities and the standardized formats for documenting them are presented in the SAP.

The precision and accuracy of pH and conductivity measurement will be assessed in the field prior to analysis. The calibration of field instruments will be conducted at the beginning of the day prior to their use. The calibration of the pH meter (Appendix C) will be performed by taking two measurements on each of two standard buffer solutions of pH 4 and pH 7. The accuracy will be determined by the difference in replicate samples of the standard pH buffer solutions. These measurements should be within  $\pm 0.1$  pH units from the value of the standard solutions. Replicate

analysis will be completed on all three standards and the difference between the replicates will be within  $\pm 0.1$  standard pH units of the known value of the standard buffer solution. The precision will be less than or equal to 0.1 difference between the two measurements on each pH standard buffer solution. If the pH meter fails to calibrate properly, a different pH meter will be calibrated and used.

The calibration measurements made for the specific conductance will be used to assess the accuracy and precision. The calibration of the instrument will be made by making two measurements on a standard. The accuracy will be within 10 percent of the standard value and precision will be less than or equal to 15 percent of the difference between the two replicate measurements of the standard. If the measurements are not within  $\pm 10$  percent of the standard or are not reproducible within  $\pm 15$  percent, the instrument will be returned to the manufacturer for maintenance and calibration.

The level of QC for the thermometer will consist of a calibration check using an ice/water slurry once at the beginning of field activities. The thermometer must read within  $\pm 1^{\circ}\text{C}$  of  $0^{\circ}\text{C}$ . If the thermometer is out of calibration, it will be replaced.

## 6.0 SAMPLING PROCEDURES

Procedures to sample municipal, industrial and residential drinking water wells are described in the SAP. Also included are descriptions of sampling containers, sample preservation techniques, procedures for sample bottle and sampler decontamination, sample documentation, packaging and shipping. The sample containers will be four 40 ml VOA vials. They will be preserved by cooling with ice to 4° C. The containers will be filled completely and have no air space or bubbles. The maximum allowable holding time is 5 days. The sample container required for metals is one 1-liter high density polyethylene bottles (unfiltered) for a water matrix. Bottles will be filled to the shoulder and preserved with 5-ml 1:1 HNO<sub>3</sub> to pH<2. The maximum holding time is 6 months for the metals of concern.

The Southeast Rockford Operable Unit will use the IEPA Sample Bottle Program. Sample containers will be prepared as specified in the IEPA Exhibit A, Scope of Work for FY90, Sample Bottle Supply Service (Appendix D). The IEPA sample bottle contractors' quality control data generated for the lots used in this project will be available upon request. This data may be obtained from the contractor through the IEPA Project Manager.

## 7.0 SAMPLE CUSTODY

### 7.1 INTRODUCTION

It is USEPA and Region V policy to follow the USEPA Region V sample custody or chain-of-custody protocols as described in "NEIC Policies and Procedures", EPA-330/9-78-001-R, revised May 1986. This Custody is in three parts: sample collection, laboratory, and final evidence files. Final evidence files, including all originals of laboratory reports and purge files, are maintained under document control in a secure area.

A sample or evidence file is under your custody if the documents:

- o are in your possession;
- o are in your view, after being placed in your possession;
- o were in your possession and you placed them in a secured location;  
or
- o are in a designated secure area.

### 7.2 FIELD-SPECIFIC CUSTODY PROCEDURES

The sample packaging and shipment procedures summarized below will ensure that the samples will arrive at the laboratory with the chain-of-custody intact.

Field procedures are as follows:

- (a) The field sampler will be personally responsible for the care and custody of the samples until they are transferred or properly dispatched. As few people as possible should handle the samples.

- (b) All bottles will be **tagged** with sample numbers and locations. If applicable, the **Sample Management Office (SMO)** number and stickers will be affixed.
- (c) Sample tags will be **completed** for each sample using waterproof ink unless prohibited by **weather** conditions. If prohibited, a logbook notation would note that a pencil was used to fill out the sample tag because the **ballpoint** would not function in freezing weather.
- (d) The contractor's **site manager** will review all field activities to determine whether **proper custody** procedures were followed during the field work and **decide** if additional samples are required. He or she should **notify the Project Manager** of any breach or irregularity in **chain-of-custody** procedures.

Transfer of custody and **shipment** procedures are as follows:

- (a) Samples will be **accompanied** by an accurately completed **chain-of-custody form**. The sample numbers and locations will be listed on the **chain-of-custody form**. When transferring the possession of **samples**, the individuals relinquishing and receiving will sign, date, and **note** the time on the record. This record documents **transfer of custody** of samples from the sampler to another person, to a **mobile laboratory**, to the permanent laboratory, or to/from a **secure storage area**.
- (b) Samples will be **properly packaged** for shipment and dispatched to the appropriate **laboratory** for analysis, with a separate signed custody record **enclosed** in each sample box or cooler. Shipping containers will be **locked** and secured with strapping tape and EPA custody seals for **shipment** to the laboratory. The preferred procedure includes **use of a custody seal** attached to the front

right and back left of the cooler. The custody seals are covered with clear plastic tape. The cooler is strapped shut with strapping tape in at least two locations.

- (c) Whenever samples are split with a source or government agency, a separate sample receipt will be prepared for those samples and marked to indicate with whom the samples are being split. The person relinquishing the samples to the facility or agency should request the representative's signature acknowledging sample receipt. If the representative is unavailable or refuses, this should be noted in the "received by" space.
- (d) All shipments will be accompanied by the chain-of-custody record identifying the contents. The original record will accompany the shipment; the pink and yellow copies will be retained by the sampler for return to the sampling office.
- (e) If the samples are sent by common carrier, a bill of lading should be used. Receipts of bills of lading will be retained as part of the permanent documentation. If sent by mail, the package will be registered with return receipt requested. Commercial carriers are not required to sign off on the custody form as long as the custody forms are sealed inside the sample cooler and the custody seals remain intact.

### 7.3 LABORATORY CUSTODY PROCEDURES

The chain-of-custody procedures for CLP are described in the Statement of Works (SOWs) for Routine Analytical Services (RAS). This same custody procedure applies to Special Analytical Services (SAS). These custody procedures along with the holding time requirements for CLP samples are described in the appropriate SOW documents.



#### 7.4 FINAL EVIDENCE FILES CUSTODY PROCEDURES

The final evidence files from the CLP Laboratory are maintained by the Region V CRL Laboratory Support Team Data Coordinator.

The contractor will maintain the site files along with all relevant records, reports, logs, field notebooks, pictures, subcontractor reports and the data and data reviews of the CLP generated laboratory data in a limited access area and under custody of the contractor's Site Manager.

The final evidence file will include, but not be limited to:

Project Plans	Computer Printouts
Field Data Records	Graphs
Logbooks	Calculations
Sample Tags	Raw Data Summaries
Chain-of-Custody Records	Data/Purge Files
Sample Tracking Records	Correspondence
Analytical Logbook Pages	Data Validation Files and Reports
Bench Sheets	Report Notes
Instrument Readout Records	Miscellaneous-Photos, Maps, Drawings, etc.
	Final Report

Upon completion of the project, the evidence files, in their entirety, will be turned over to IEPA for archiving.

## 8.0 CALIBRATION PROCEDURES AND FREQUENCIES

As an activity that affects **data quality**, instrument calibration must be performed in accordance with **formal** written procedures. The instrument must be calibrated and **maintained by** trained personnel to operate within manufacturer's specifications. **Field** instruments will be calibrated prior to any measurements taken in **the field**. Field instruments will be recalibrated if found to be **necessary** during routine QC checks. Subsection 14.2.2 discusses calibration of **field** instruments. The calibration procedures for laboratory **analytical** equipment will be maintained within the criteria established in **the appropriate** SAS Client Request Forms provided in Appendix B as **discussed** in Subsection 14.1.2.

## 9.0 ANALYTICAL PROCEDURES

For the Southeast Rockford Operable Unit study, the analytical procedures for CLP Laboratory are discussed in Subsection 14.1.1 of the QAPP. Analytical procedures for field analytical equipment are discussed in the SAP and in Subsection 14.2.1 of the QAPP.

#### 10.0 INTERNAL QUALITY CONTROL CHECKS

Internal quality control checks for field instruments are discussed in Subsection 14.2.3. If any field instrument fails the QC checks for calibration it will be recalibrated, repaired, or replaced, whichever is necessary. Quality control checks for laboratory instrumentation are discussed in Subsection 14.1.3 and detailed in the SAS Client Request Forms provided in Appendix B.

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## 11.0 DATA REDUCTION, VALIDATION AND REPORTING

Data reduction, validation and reporting will be performed in accordance with the general requirements of the USEPA CLP. Specific data reduction, validation and reporting requirements for the Southeast Rockford Operable Unit Technical Memorandum will be discussed in Section 14.

## 12.0 PERFORMANCE AND SYSTEMS AUDITS

Performance and systems audits may be conducted for activities performed by any entity performing services on this project, including CLP laboratories, CRL and field team activities.

Performance and systems audits of field activities may be performed periodically by the CDM QC Manager in accordance with CDM audit procedures, the USEPA Region V Environmental Services Division or the IEPA Project Manager. Audits will be performed to evaluate sampling activities including sample ID, chain-of-custody, field documentation and sampling procedures. The results of the field audits will be reported as part of the Quality Assurance Reports to management.

The performance and systems audits for analytical and field data are described in Section 14.

### 13.0 PREVENTIVE MAINTENANCE

Preventive maintenance for field instruments and laboratory analytical equipment is discussed in Section 14 of this QAPP.

## 14.0 ANALYTICAL SERVICES

General programmatic requirements for analytical procedures are established in the CDM Quality Assurance Program Manual. This program establishes the need for formally documented procedures which require:

- o The use of CLP laboratories and analytical procedures for all enforcement, litigation, and evidentiary data,

and

- o The specification of analytical procedures for all analytical field procedures and non-CLP generated data.

### 14.1 SPECIAL ANALYTICAL SERVICES

#### 14.1.1 LABORATORY PROCEDURES

The analytical procedures to be used for performing the SAS analyses are described in the SAS requests in Appendix B. Also specified in the SAS requests are calibration procedures, frequency of calibration and the internal quality control checks required for each analysis. The SAS specifications also include the types of audits required (sample spikes, surrogate spikes, reference samples, control blanks), the frequency of each audit, the compounds to be used for sample spikes and surrogate spikes, and the quality control acceptance criteria for these audits.

#### 14.1.2 CALIBRATION PROCEDURES AND FREQUENCY

The calibration procedures for laboratories participating in the CLP are specified under the program and will insure proper calibration of instruments used to analyze samples shipped to those laboratories. The



specific calibration procedures for the SAS methods to be used for this project are specified in the SAS requests in Appendix B.

#### 14.1.3 INTERNAL QUALITY CONTROL CHECKS

There are two types of quality assurance mechanisms used by the CLP to ensure the production of analytical data of known and documented usable quality: analytical method quality control (QC), and program quality assurance (QA). The internal quality control procedures for routine analytical services from CLP are specified in the SOWs for organic (SOW-2/88) and inorganic (SOW-7/88) analyses. These specifications include the types of audits required (sample spikes, surrogate spikes, reference samples, controls, blanks), the frequency of each audit, the compounds to be used for sample spikes and surrogate spikes, and the quality control acceptance criteria for these audits.

For this project, the specific internal quality control checks as modified from those specified in the SOWs are described in the SAS requests in Appendix B.

#### 14.1.4 SAMPLE CUSTODY PROCEDURES

Laboratories that are in the CLP as well as non-CLP laboratories authorized to do SAS analyses will follow the sample custody procedures specified in the CLP SOW 2/88 for organic analysis and SOW 7/88 for inorganics.

#### 14.1.5 PERFORMANCE AND SYSTEMS AUDITS

Performance and systems audits are used to evaluate laboratory performance. These audits consist of random data audits, continuous trend analysis of laboratory quality control data and quarterly analysis of performance evaluation (PE) samples. Systems audits are performed to verify continuity of personnel, instrumentation and quality control requirements contained in

the SOW. For CLP laboratories performing SAS analyses, systems audits are performed by USEPA Region V Central Regional Laboratory and consist of annual on-site inspections. In addition to these audits, additional performance audits may be requested in the SAS requests for specific analyses.

For laboratories authorized to do SAS analyses only, audit procedures are as specified by the Sample Management Office.

#### 14.1.6 DATA REDUCTION, VALIDATION AND REPORTING

Data resulting from SAS requests will be reduced, validated and reported in accordance with the specifications of the Contract Laboratory Program (Figure 14-1). Following the analyses, data evaluation, and reduction by the CLP Laboratory, the data will be sent to CDM for data validation in accordance with the procedures described in Section 14.1.5. In addition to these procedures, special procedures may be requested in the SAS requests for specific analyses. Data will be reported in accordance with the CLP SOW-2/88 for organics, SOW-7/88 for inorganics, and with SASs in Appendix B.

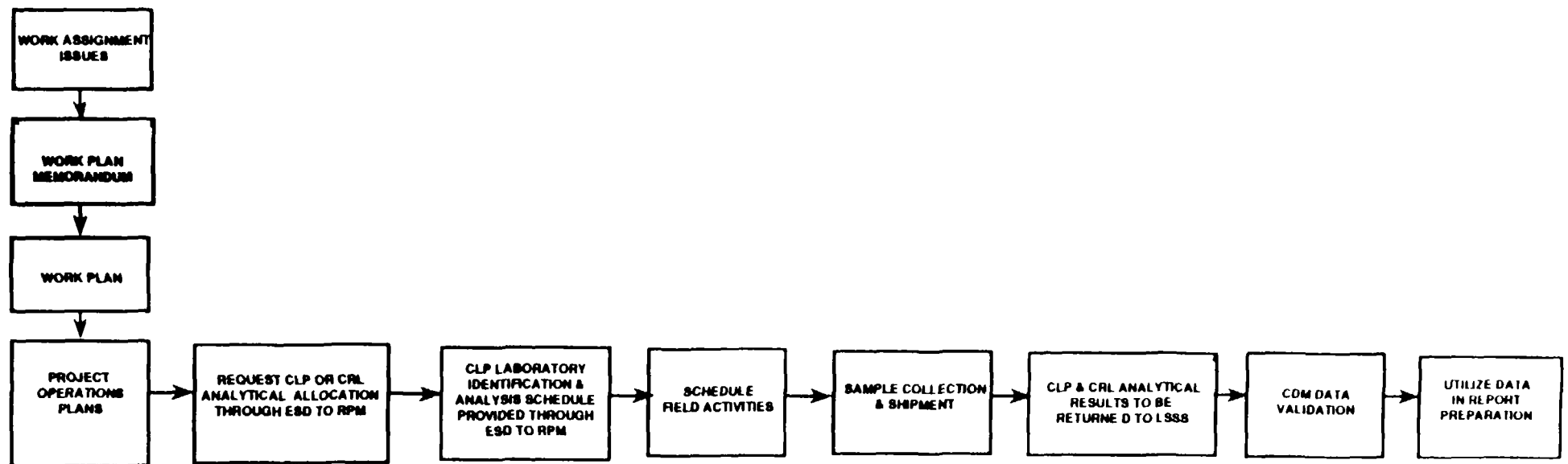
#### 14.1.7 PROCEDURES FOR ASSESSING DATA PRECISION, ACCURACY AND COMPLETENESS

Analytical data from the SAS is assessed for contractual compliance and completeness by the Sample Management Office, based on the requirements of the SAS request. The CDM data assessment specialist reviews the data for completeness, accuracy and precision, based on the requirements outlined in the SAS request. The general procedure used for data assessment is described in Laboratory Data Validation Functional Guidelines for Evaluating Organic and Inorganic Analyses, prepared by USEPA Data Validation Work Group, February 1, 1988.

#### 14.1.8 PREVENTIVE MAINTENANCE

All laboratories participating in the CLP are required under respective IFBs for organics and inorganics to employ Standard Operating Procedures

FIGURE 14-1 CLP ANALYTICAL DATA MANAGEMENT FLOW CHART



CRL-CENTRAL REGION LABORATORY

LSSS-LABORATORY SCIENTIFIC SUPPORT SECTION,CRL

US3964

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(SOPs) for preventive maintenance for each measurement system and required support activity. All maintenance activity must be documented in logbooks to provide a history of past activities.

#### 14.1.9 CORRECTIVE ACTION

Corrective action for SAS requests will be implemented as required by the specific SAS request, as well as by standard CLP procedures. Corrective action for the CLP is implemented at several different levels. The laboratories participating in the CLP are required to have a written SOP specifying corrective action to be taken when an analytical error is discovered or the analytical system is determined to be out of control. The SOP requires documentation of the corrective action and notification of the analyst of the error and of the correct procedures.

The Sample Management Office also may request corrective action for any contractual nonconformances identified by audit or data validation. CDM or the IEPA may request corrective action by the laboratories for any nonconformances identified in the data validation process through the Sample Management Office or, for minor problems, the lab may be contacted directly.

#### 14.2 FIELD SCREENING SERVICES

##### 14.2.1 ANALYTICAL PROCEDURES

The procedures for measurements taken in the field are described in the SAP. The relevant SOPs in the CDM Site Investigation Procedures Manual are as follows:

<u>Procedure Title</u>	<u>SIPM Method No.</u>
o Operation Procedure YSI Model 33 SCT Meter	5617002

<u>Procedure Title</u>	<u>SIPM Method No.</u>
o Operation Procedure for HaakeBuchler pH Stick	5617003
o Procedure for Determining Temperature of Groundwater	5617004

The SOPs are presented in **Appendix A** of the Southeast Rockford Operable Unit SAP.

All procedures used and results obtained will be documented in the field logbook.

#### 14.2.2 CALIBRATION PROCEDURES AND FREQUENCY

The SOPs for field instrument calibration to be used during the Southeast Rockford Operable Unit (**Appendix C**) are detailed in the CDM Site Investigation Procedures Manual (**SIPM**). These procedures are listed below:

<u>Procedure Title</u>	<u>SIPM Method No.</u>
o Equipment and Instrument Calibration and Maintenance, Gen.	6600001
o Calibration and Maintenance Procedure YSI Model 33 SCT Meter	6617002
o Calibration and Maintenance Procedures HaakeBuchler pH Stick	6617003

The calibration for the **thermometer** will be performed by using an ice/water slurry to check for accuracy. The thermometer shall be within  $\pm 1^\circ$  of  $0^\circ\text{C}$  when the thermometer has equilibrated with the ice/water slurry.

All calibration performed in the field will be documented in the field logbook. Calibration frequency will be once daily unless the routine instrument QC check indicates that recalibration is necessary.

#### 14.2.3 INTERNAL QUALITY CONTROL CHECKS

Quality control procedures for field measurements are limited to checking the reproducibility of the measurement by obtaining multiple readings and/or by calibrating the instruments (where appropriate). SOPs for the field instruments are listed in Subsection 14.2.2 and contained in Appendix C of this QAPP. Quality control of field sampling will involve collection of field duplicates and blanks in accordance with the applicable procedures described in the SAP and the level of effort indicated in Table 3-1 in Subsection 3.4 of this QAPP.

#### 14.2.4 PERFORMANCE AND SYSTEMS AUDITS

Audits of field activities, including field screening, are described in Section 12.0. If the Southeast Rockford area is chosen for a performance audit, all audit procedures and results will be documented.

#### 14.2.5 DATA REDUCTION, VALIDATION, AND REPORTING

Raw data from field measurements and sample collection activities will be appropriately recorded in the field logbook. If the data is to be used in the project reports, it will be reduced or summarized, and the method of reduction will be documented in the report.

#### 14.2.6 PROCEDURES FOR ASSESSING DATA PRECISION, ACCURACY, AND COMPLETENESS

Data from field measurements will be assessed by thorough review of QC data (calibrations, standards, blanks, replicates), documentation that analytical procedures were adhered to, and reports from systems audits. All data will be reviewed for completeness by the principal investigator.

#### 14.2.7 PREVENTIVE MAINTENANCE

The field equipment to be used for this project includes a field pH meter, a conductivity meter and a thermometer. Preventive maintenance of field analytical equipment used at Southeast Rockford will be conducted in accordance with the maintenance procedures outlined in the standard calibration and maintenance procedures provided in Appendix C. Specific preventive maintenance procedures for this equipment are referenced in the SAP. The Field Manager will be responsible for implementing these procedures, as well as for providing documentation of the procedures carried out both in the logbook and on the proper forms.

#### 14.2.8 CORRECTIVE ACTION

Any nonconformance identified during field screening procedures will require implementation of corrective action and documentation of the action taken. If nonconformances are identified during data assessment, the principal investigator may request corrective action.

## 15.0 CORRECTIVE ACTION

Corrective action for CLP laboratory work and field work are discussed in Section 14.

If any nonconformance with **established** quality control procedures is identified during field operations, the Project Manager will be responsible for developing and initiating corrective action. The IEPA Project Manager will be responsible for reporting any proposed, developed or initiated corrective actions to the USEPA Region V Project Officer for review and approval. Corrective action **needed** for on-site activities will be initiated by the field team leader, but must be approved by the Project Manager.

The USEPA CRL is responsible for **approving** and initialing corrective actions for USEPA CLP Laboratories. The laboratories will be notified of the nonconformance.



#### 16.0 QUALITY ASSURANCE REPORTS TO THE MANAGEMENT

The QA reports will be a part of the regular quarterly project reports that IEPA submits to the USEPA Region V RPMS. These reports will contain (but not be limited to) project status, results of performance and systems audits, data quality assessments, quality assurance problems with proposed corrective actions and QAPP amendments.

## 17.0 GLOSSARY OF TERMS

ACCURACY - The degree of agreement of a measurement (or an average of measurements of the same thing),  $X$ , with an accepted referenced or true value,  $T$ , usually expressed as the difference between the two values,  $X-T$ , or the difference as a percentage of the reference or true value,  $100 (X-T)/T$ , and sometimes expressed as a ratio,  $X/T$ . Accuracy is a measure of the bias in a system.

AUDIT - A systematic check to determine the quality of operation of some function or activity. Audits may be of two basic types: (1) system audits that consist of a review of the quality control system to ensure that a comprehensive set of quality control methods, procedures, reviews, and signoff approvals is established or in place, and (2) performance audits in which project activities are observed in process for their compliance with the established quality control procedures and requirements.

COMPARABILITY - Expresses the confidence with which one data set can be compared to another.

COMPLETENESS - A measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions.

DATA VALIDATION - A systematic process for reviewing a body of data against a set of criteria to provide assurance that the data are adequate for their intended use. Data validation consists of data editing, screening, checking, auditing, verification, certification, and review.

PRECISION - A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is best expressed in terms of the standard deviation. Various measures of precision exist depending upon the "prescribed similar conditions."

QUALITY ASSURANCE - The total integrated program for assuring the reliability of monitoring and measurement data. A system for integrating the quality planning, quality assessment, and quality improvement effort to meet user requirements.

QUALITY ASSURANCE PROGRAM PLAN - An orderly assemblage of management policies, objectives, principles, and general procedures by which an agency or laboratory outlines how it intends to produce data of known and accepted quality.

QUALITY ASSURANCE PROJECT PLAN - An orderly assemblage of detailed and specific procedures which delineates how data of known and accepted quality are produced for a specific project. (A given agency or laboratory would have only one quality assurance program plan, but would have a quality assurance project plan for each of its projects.)

QUALITY CONTROL - The routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process.

REPRESENTATIVENESS - Expresses the confidence with which one data set can be compared to another.

STANDARD OPERATING PROCEDURE - A written document which details an operation, analysis, or action whose mechanisms are thoroughly prescribed and which is commonly accepted as the method for performing certain routine or repetitive tasks.

**APPENDIX A**  
**EXISTING DATA SUMMARY**

**EPA DATA**  
**VOC ANALYSIS**

US3974

Source: USEPA/TAT

Year: 1989

**SOUTHEAST ROCKFORD  
SUMMARY OF EXISTING DATA**

PARAMETER	# DETECTED/ # SAMPLED	RANGE DETECTED (µg/l )	MCL* (µg/l)	PRS*** (µg/l)	Samples ≥ MCL		Samples ≥ 50% MCL		Samples ≥ PRS	
					#	%	#	%	#	%
Trichloroethylene	97/113	.45-120	5	5	67	59.3%	76	67.3%	67	59.3%
1,1,1-Trichloroethane	97/113	.60-397	200	200	15	13.3%	35	31.0%	15	13.3%
Cis-1,2-Dichloroethylene	87/113	.58-323	70**	100	12	10.6%	29	25.7%	5	4.4%
Trans-1,2-Dichloroethylene	13/113	.57-2.5	100**	100	0	0.0%	0	0.0%	0	0.0%
1,2-Dichloroethane	37/113	.52-4.0	5	5	0	0.0%	6	5.3%	0	0.0%
1,1-Dichloroethane	85/113	.69-133	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

\*Safe Drinking Water Act Maximum Contaminant Level (MCL)

\*\*Proposed MCL (May, 1989)

\*\*\*Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)

FREQUENCY OF DETECTION: SOUTHEAST ROCKFORD

EPA/TAT 1989

PARAMETER	DETECTION LIMIT	2917 24th St S-89	2935 24TH S-90	2911 23rd S-91	2830 23rd S-92	2817 23rd S-93	2923 22nd St S-94	2016 21nd St S-95	111 Canal S-96
Trichloroethylene	0.2	79.3	17.4	65.60	68.7	91.3	17.0	68.4	73.1
1,1,1-Trichloroethane	0.5	397	122	343	261	384	75.7	29.7	279
Cis-1,2-Dichloroethylene	0.5	323	93.90	273	95.2	113	42.3	96.4	98
Trans-1,2-Dichloroethylene	0.5	1.62	X	1.32	0.94	1.20	X	1.24	1.28
1,2-Dichloroethane	0.5	2.80	1.03	2.85	1.36	2.09	0.62	1.50	1.59
1,1-Dichloroethane	0.5	117	41.7	103	61.2	76.1	25.6	81.9	66.4
Analytical Number		23444	23445	23446	23447	23448	23449	23450	23451
CDM Number		1	2	3	4	5	6	7	8
Date		10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90

PARAMETER	2825 21st St S-97	2901 22nd S-99	1501 Hawthorne S-98	2917 20th S-100	2921 Horton S-101	3015 20th S-102	2925 Marshall S-103	2741 Cannon S-104	2737 Hansen S-106
Trichloroethylene	73.8	56.2	X	16.3	22.9	2.17	19.1	36.8	24.8
1,1,1-Trichloroethane	306	235	X	88.4	75.5	11.3	44.4	158	109
Cis-1,2-Dichloroethylene	95.0	37.8	X	29.8	19.8	2.54	14.4	40.4	26.3
Trans-1,2-Dichloroethylene	X	X	X	X	X	X	X	X	X
1,2-Dichloroethane	X	X	X	X	X	X	X	1.12	X
1,1-Dichloroethane	64.3	33.9	X	18.2	15.6	X	12.5	38.2	24.9
Analytical Number	23452	23453	23454	23455	23456	23457	23458	23459	23460
CDM Number	9	10	11	12	13	14	15	16	17
Date	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90

US3976

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

EPA/TAT 1989

PARAMETER	1505 Halsted S-107	2730 10th S-8	2734 Lapey S-11	2814 Lapey S-12	1613 Roosevelt S-13	2718 11th S-14	2822 11th S-15	2701 18th S-16	2637 Cannon S-17
Trichloroethylene	22.1	28.0	17.4	16.3	16.3	34.8	9.9	1.37	2.19
1,1,1-Trichloroethane	100	142	21.0	65.4	66.8	167	54.5	7.55	39.6
Cis-1,2-Dichloroethylene	23.3	29.6	23.5	14	14.0	42.9	7.15	5.24	3.76
Trans-1,2-Dichloroethylene	X	X	X	X	X	X	X	X	X
1,2-Dichloroethane	X	X	X	X	X	X	X	X	X
1,1-Dichloroethane	22.8	31.3	27.1	14.2	14.6	40.4	8.26	10.1	6.75
Analytical Number	23461	23545	23546	23547	23548	23549	23550	23551	23552
COM Number	18	19	20	21	22	23	24	25	26
Date	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90	10/24/90

PARAMETER	2717 Bidwell S-19	1080 3rd S-19	2702 Sewell S-1	2922 Sewell S-2	2930 Hansen S-3	2745 Hansen S-4	2922 21st S-8	2512 Lindale S-7	2518 Lindberg S-8
Trichloroethylene	25.1	X	1.53	18.60	5.97	41.8	31.7	0.89	3.09
1,1,1-Trichloroethane	132	X	15.6	49.5	18.5	172	151	1.25	7.66
Cis-1,2-Dichloroethylene	27.5	X	4.74	14.1	3.09	42.6	94.60	X	1.9
Trans-1,2-Dichloroethylene	X	X	X	X	X	X	X	X	X
1,2-Dichloroethane	X	X	X	X	X	1.86	1.96	X	X
1,1-Dichloroethane	29.8	X	14.70	11.8	2.73	49.10	40.7	X	1.16
Analytical Number	23553	23554	22837	22838	22839	22840	22841	22842	22843
COM Number	27	28	1	2	3	4	5	6	7
Date	10/24/90	10/24/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90

US3977



FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

EPA/TAT 1989

PARAMETER	3141 20th S-9	3112 18th S-10	2814 20th S-11	3025 18th S-12	3118 17th S-13	1725 Damen S-14	2941 Hansen S-15	2944 Horton S-16	2914 Horton S-17
Trichloroethylene	X	0.75	120	2.72	1.25	X	26.4	25.0	44.0
1,1,1-Trichloroethane	X	1.12	283	9.25	2.51	X	57.4	60.0	147
Cis-1,2-Dichloroethylene	X	X	138	3.32	X	X	19.7	19.0	40.3
Trans-1,2-Dichloroethylene	X	X	2.50	X	X	X	X	X	X
1,2-Dichloroethane	X	X	4.00	X	X	X	1.33	1.27	1.61
1,1-Dichloroethane	X	X	133.00	1.77	X	X	22.0	21.3	40.0
Analytical Number	22844	22845	22846	22847	22848	22849	22850	22851	22852
CDM Number	8	9	10	11	12	13	14	15	16
Date	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90

PARAMETER	2817 Horton S-18	2804 Horton S-20	2806 Horton S-21	2725 Horton S-22	21316 Alton S-23	3133 Marshall S-24	3111 Marshall S-25	3030 Marshall S-26	3006 Marshall S-27
Trichloroethylene	67.8	52.4	40.0	11.4	2.29	1.79	1.41	5.88	10.6
1,1,1-Trichloroethane	305	255	197	45.4	21.0	3.15	2.64	3.06	13.5
Cis-1,2-Dichloroethylene	65.5	66.1	50.6	39.6	7.06	X	X	3.80	7.55
Trans-1,2-Dichloroethylene	0.68	0.82	0.76	X	X	X	X	X	X
1,2-Dichloroethane	2.39	2.86	2.76	1.42	X	X	X	2.01	1.26
1,1-Dichloroethane	58.8	55.3	42.4	57.8	6.90	X	X	9.11	12.5
Analytical Number	22853	22854	22855	22856	22857	22858	22859	22860	22861
CDM Number	17	18	19	20	21	22	23	24	25
Date	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90

US3978

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

EPA/TAT 1989

PARAMETER	2941 Marshall S-28	2905 Marshall S-29	2837 Marshall S-30	2801 Marshall S-31	2738 Marshall S-32	2717 Marshall S-33	2706 Marshall S-34	3140 Sewell S-35	3141 Sewell S-36
Trichloroethylene	10.5	38.3	39.4	62.4	65.6	1.10	11.3	X	X
1,1,1-Trichloroethane	30.3	113	156.0	310	329	16.0	54.8	X	X
Cis-1,2-Dichloroethylene	6.84	31.5	40.2	74.7	93.0	5.61	26.8	X	X
Trans-1,2-Dichloroethylene	X	X	X	0.79	1.14	X	X	X	X
1,2-Dichloroethane	X	0.93	1.40	2.01	2.53	X	0.95	X	X
1,1-Dichloroethane	4.96	26.0	40.8	61.2	75.3	17.9	39.9	X	X
Analytical Number	22862	22863	22864	22865	22866	22867	22868	22869	22870
CDM Number	26	27	28	29	30	31	32	33	34
Date	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90

PARAMETER	3181 Sewell S-37	3002 Sewell S-38	3002 Sewell S-39	2841 Sewell S-40	2813 Sewell S-42	2742 Sewell S-43	2722 Sewell S-44	3318 Potter S-45	3318 Potter S-46
Trichloroethylene	X	2.58	9.51	24.2	38.8	0.53	2.85	X	X
1,1,1-Trichloroethane	X	9.02	26.4	106	227	5.76	27.5	X	X
Cis-1,2-Dichloroethylene	X	2.12	5.87	35.30	41.4	0.58	11.5	X	X
Trans-1,2-Dichloroethylene	X	X	X	X	X	X	X	X	X
1,2-Dichloroethane	X	X	X	1.12	1.73	X	X	X	X
1,1-Dichloroethane	X	1.43	4.06	36.7	44.0	0.78	29.9	X	X
Analytical Number	22871	22872	22873	22874	22875	22876	22877	22878	22879
CDM Number	35	36	37	38	39	40	41	42	43
Date	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90

US3979  
6/6/97

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD

EPA/TAT 1989

PARAMETER	1825 Johnson S-48	2929 Powell S-49	2829 Powell S-50	2837 Cannon S-51	2822 Cannon S-52	2866 Cannon S-53	2834 Cannon S-55	3008 Cannon S-56	3000 Hansen S-57
Trichloroethylene	X	13.6	30.4	37.0	24.6	24.9	9.42	3.25	2.78
1,1,1-Trichloroethane	X	39.3	165	88.3	140	143	33.5	13.2	11.2
Cis-1,2-Dichloroethylene	X	7.59	31.7	24.1	42.0	40.2	5.37	3.08	2.54
Trans-1,2-Dichloroethylene	X	X	X	X	X	X	X	X	X
1,2-Dichloroethane	X	X	1.2	0.52	0.75	0.76	X	X	X
1,1-Dichloroethane	X	5.77	33.9	23.8	47.9	48.2	4.22	2.19	1.75
Analytical Number	22880	22881	22882	22883	22884	22885	22886	22887	22888
COM Number	44	45	46	47	48	49	50	51	52
Date	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90

PARAMETER	2810 Hansen S-58	2848 Hansen S-59	2833 Hansen S-60	2804 Hansen S-61	2946 Kinsey S-62	2917 Kinsey S-63	2901 Kinsey S-64	2833 Kinsey S-65	2815 Kinsey S-66
Trichloroethylene	10.6	28.3	23.9	19.1	2.67	1.90	5.56	17.8	33.7
1,1,1-Trichloroethane	28.3	75.0	52.8	201	5.35	7.31	18.1	62.9	133
Cis-1,2-Dichloroethylene	5.34	20.8	17.6	47.5	1.86	0.86	2.63	11.9	27.7
Trans-1,2-Dichloroethylene	X	X	X	0.57	X	X	X	X	X
1,2-Dichloroethane	X	X	X	0.99	X	X	X	X	0.57
1,1-Dichloroethane	4.38	18.8	17.8	43.8	1.50	0.90	2.62	10.9	33.8
Analytical Number	22889	22890	22891	22892	22893	22894	22895	22896	22897
COM Number	53	54	55	56	57	58	59	60	61
Date	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90

US3980

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD

EPA/TAT 1989

PARAMETER	2742 Kinsey S-67	2826 11th S-68	3141 10th S-69	3141 40th S-70	2614 Kinsey S-71	2902 11th S-72	2845 Lapey S-74	2929 11th S-75	2911 Lapey S-76
Trichloroethylene	33.4	27.2	1.99	1.99	1.18	10.5	13.3	3.40	3.62
1,1,1-Trichloroethane	156	68.40	4.27	5.21	16.7	35.2	47.3	13.2	14.2
Cis-1,2-Dichloroethylene	39.7	21.3	X	X	3.42	5.21	7.35	2.40	2.11
Trans-1,2-Dichloroethylene	X	X	X	X	X	X	X	X	X
1,2-Dichloroethane	1.5	X	X	X	X	X	X	X	X
1,1-Dichloroethane	38.0	22.0	X	X	9.90	4.83	7.01	2.02	1.93
Analytical Number	22898	22899	22900	22901	22902	22903	22904	22905	22906
CDM Number	62	63	64	65	66	67	68	69	70
Date	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90

PARAMETER	2902 Lapey S-73	2931 Lapey S-74	3225 9th S-81	3329 9th S-82	3305 Lapey S-83	2106 Sandy S-84 Hollow	2746 Lapey S-86	220 Brooke S-20	3113 Carlson S-21
Trichloroethylene	2.29	1.42	0.56	X	X	X	29.9	X	21.90
1,1,1-Trichloroethane	7.35	4.80	2.01	0.60	X	X	158	X	0.62
Cis-1,2-Dichloroethylene	0.62	X	X	X	X	X	29.2	X	1.92
Trans-1,2-Dichloroethylene	X	X	X	X	X	X	X	X	X
1,2-Dichloroethane	X	X	X	X	X	X	0.77	X	X
1,1-Dichloroethane	0.69	X	X	X	X	X	32.2	X	X
Analytical Number	22908	22909	22910	22911	22012	22913	22914	24967.0	24968
CDM Number	71	72	73	74	75	76	77	1	2
Date	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	10/3-5/90	12/8/90	12/8/90

US3981

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD

EPA/TAT 1989

PARAMETER	3007 Carlson S-23	823 Ranger S-24	606 New Milnor S-25	2522 25th S-26	2484 Mariposa S-28	5002 Sherwood S-29
Trichloroethylene	1.37	17.5	21.7	0.45	x	x
1,1,1-Trichloroethane	x	41.3	37.2	23.8	x	x
Cis-1,2-Dichloroethylene	1.90	12.9	0.74	x	x	x
Trans-1,2-Dichloroethylene	x	x	x	x	x	x
1,2-Dichloroethane	x	1.87	x	x	x	x
1,1-Dichloroethane	x	16.3	0.87	2.91	x	x
Analytical Number	24969	24970	24972	24873	24974	24975
COM Number	3	4	5	6	7	8
Date	12/8/90	12/8/90	12/8/90	12/8/90	12/8/90	12/8/90

US3982

**EPA DATA**  
**FULL VOC ANALYSIS**

US3983

## ( MS ANALYSIS

PARAMETER	#DETECTED/ #SAMPLED	RANGE DETECTED (µg/l)	MCL* (µg/l)	PRS*** (µg/l)	Samples ≥ MCL		Samples ≥ 50% MCL		Samples ≥ PRS	
					#	%	#	%	#	%
Benzene			5	5						
Bromoform	1\14	1.1								
Bromomethane										
Carbon Tetrachloride			5	5						
Chlorobenzene										
Chloroethane										
2-Chloroethylvinyl Ether										
Chloroform	7\14 (a)	3.4-8.3								
Chloromethane	1\14	2.9								
Dibromochloromethane										
Dichlorobromomethane										
1,1-Dichloroethane	11\14	1.9-320								
1,2-Dichloroethane	7\14	1.3-4.0	5	5			1	7.1%		
1,1-Dichloroethylene	11\14	7.7-47.8	7	7	10	71.4%	10	71.4%	10	71.4%
1,2-Dichloroethylene	10\14	5.7-894								
Dichloromethane	2\14	1.8-2.1								
1,2-Dichloropropane	2\14		5**							
Cis-1,3-Dichloropropane										
Trans-1,3-Dichloropropane										
Ethylbenzene			700**	700						
Methyl Chloride	2\2 (b)	15.5-19.5								
1,1,2,2-Tetrachloroethane	1\14	1.9								
Tetrachloroethene	6\14	.77-6.7	5**	5	2	14.3%	3	21.4%	2	14.3%
Trichloroethene			2000**	2000						
	11\14 (a)	2.1-245	200		3	21.4%	8	57.1%		
	3\14	1.1-2.8								
	11\14	15.5-104	5	5	11	78.6%	11	78.6%	11	78.6%
	1\14	3								
			2	2						
				10000						

\* (MCL)

Standards (PRS)

are not legible. These are not included in the tabulation of the following columns.  
Chloride.

US3984

Source: USEPA/TAT  
Year: 1989

# SOUTHEAST ROCKFORD DATA SUMMARY

## GC-MS ANALYSIS

PARAMETER	#DETECTED/ #SAMPLED	RANGE DETECTED (µg/l)	MCL* (µg/l)	PRS*** (µg/l)	Samples ≥ MCL		Samples ≥ 50% MCL		Samples ≥ PRS	
					#	%	#	%	#	%
Benzene			5	5						
Bromoform	1\14	1.1								
Bromomethane										
Carbon Tetrachloride			5	5						
Chlorobenzene										
Chloroethane										
2-Chloroethylvinyl Ether										
Chloroform	7\14 (a)	3.4-8.3								
Chloromethane	1\14	2.9								
Dibromochloromethane										
Dichlorobromomethane										
1,1-Dichloroethane	11\14	1.9-320								
1,2-Dichloroethane	7\14	1.3-4.0	5	5			1	7.1%		
1,1-Dichloroethylene	11\14	7.7-47.8	7	7	10	71.4%	10	71.4%	10	71.4%
1,2-Dichloroethylene	10\14	5.7-89.4								
Dichloromethane	2\14	1.8-2.1								
1,2-Dichloropropane	2\14		5**							
Cis-1,3-Dichloropropane										
Trans-1,3-Dichloropropane										
Ethylbenzene			700**	700						
Methylene Chloride	2\2 (b)	15.5-19.5								
1,1,2,2,-Tetrachloroethane	1\14	1.9								
Tetrachloroethylene	6\14	.77-6.7	5**	5	2	14.3%	3	21.4%	2	14.3%
Toluene			2000**	2000						
1,1,1-Trichloroethane	11\14 (a)	2.1-245	200		3	21.4%	8	57.1%		
1,1,2 Trichloroethane	3\14	1.1-2.8								
Trichloroethylene	11\14	15.5-104	5	5	11	78.6%	11	78.6%	11	78.6%
Trichlorofluoromethane	1\14	3								
Vinyl Chloride			2	2						
m & p-Xylene (as m-Xylene)				10000						
O-Xylene										

\* Safe Drinking Water Act Maximum Contaminant Level (MCL)

\*\*Proposed MCL (May, 1989)

\*\*\*Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)

a=Results for this chemical for two of the fourteen samples are not legible. These are not included in the tabulation of the following columns.

b=Only two samples were tested for the presence of Methylene Chloride.

US3985



## EPA TAT

## FREQUENCY OF DETECTION- SOUTHEAST ROCKFORD

PARAMETER	UNITS	2706 Lapey S-10	2827 24th S-88	2729 Cannon S-105	2826 22nd S-5	2833 Horton S-18	2806 Sewell S-41	1724 Hamilton S-47	2904 Cannon S-54
Bromoforn	µg/l	X	X	X	1.1 J	X	X	X	X
Chloromethane	µg/l	X	2.85	X	X	X	X	X	X
Chloroform	µg/l	4.1 J	5.50	3.4 J	8.30	3.7 J	3.9 J	X	X
1,1-Dichloroethane	µg/l	58.50	85.30	71.20	109.00	47.00	47.30	X	12.40
1,2-Dichloroethane	µg/l	1.9 J	2.2 J	1.5 J	4.0 J	1.3 J	1.8 J	X	X
1,1-Dichloroethylene	µg/l	31.00	42.70	29.50	43.20	28.60	26.00	X	7.70
1,2-Dichloroethylene	µg/l	33.60	96.30	37.80	158.00	20.10	22.40	X	5.70
Dichloromethane	µg/l	X	X	X	2.1 J	X	X	X	X
Methylene Chloride	µg/l								
1,1,2,2-Tetrachloroethane	µg/l	X	X	X	1.9 J	X	X	X	X
Tetrachloroethylene	µg/l	X	6.60	X	6.70	2.6 J	2.3 J	X	X
1,1,1-Trichloroethane	µg/l	143.00	245.00	168.00	227.00	142.00	222.00	2.1 J	35.60
1,1,2-Trichloroethane	µg/l	1.1 J	1.8 J	X	2.8 J	X	X	X	X
Trichloroethylene	µg/l	58.90	104.00	44.00	67.10	59.40	40.50	X	15.50
Trichlorofluoroethane	µg/l	X	X	X	3.0 J	X	X	X	X
Analysis No.		23544	23442	23443	22829	22830	22831	22832	22833
		1	2	3	1	2	3	4	5
		10/24/89	10/24/89	10/24/89	10/3-5/89	10/3-5/89	10/3-5/89	10/3-5/89	10/3-5/89

PARAMETER	UNITS	2706 Lapey S-10	2827 24th S-88	2729 Cannon S-105	2826 22nd S-5	2833 Horton S-18	2806 Sewell S-41
Bromoforn	µg/l	X	X	X	X	X	X
Chloromethane	µg/l	X	X	X	X	X	X
Chloroform	µg/l	3.8 J	X	X	X	NL	NL
1,1-Dichloroethane	µg/l	57.00	X	1.9 J	X	2.13	3.20
1,2-Dichloroethane	µg/l	1.8 J	X	X	X	X	X
1,1-Dichloroethylene	µg/l	27.60	X	8.60	X	27.5	47.8
1,2-Dichloroethylene	µg/l	22.50	X	X	X	55.6	89.4
Dichloromethane	µg/l	X	1.8 J	X	X	X	X
Methylene Chloride	µg/l					15.5	19.5
1,1,2,2-Tetrachloroethane	µg/l	X	X	X	X	X	X
Tetrachloroethylene	µg/l	X	X	X	X	0.77	1.32 J
1,1,1-Trichloroethane	µg/l	162.00	3.0 J	136.00	X	NL	NL
1,1,2-Trichloroethane	µg/l	X	X	X	X	X	X
Trichloroethylene	µg/l	32.70	X	18.10	X	31.8	35.4
Trichlorofluoroethane	µg/l	X	X	X	X		
Analysis No.		22834	22835	22836	24966	>9V568	>9V567
		6	7	8	1	1	2
		10/3-5/89	10/3-5/89	10/3-5/89	12/8/89	8/10/89	8/10/89

J-Estimated Value

NL-Not Legible

X-Analyzed but not detected

US3986

**IDPH 1989  
DATASET #1**

US3987

# Summary of Historical Sampling Results

Source: IDPH

Year: 1989 (Pre-December)

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l)		MCL* (ug/l)	PRS*** (ug/l)	SAMPLES ≥ MCL		SAMPLES ≥ 50% MCL		SAMPLES ≥ PRS	
		Minimum	Maximum			#	%	#	%	#	%
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride	17\187										
Trichlorofluoromethane	2\187	2	19								
1,1-Dichloroethane	109\187	ND	63	7	7	43	23.0%	51	27.3%	43	23.0%
1,1-Dichloroethane	115\187	2	81								
Trans-1,2-Dichloroethane	12\187	1	12								
Chloroform	24\187	1	14								
1,2-Dichloroethane	25\187	ND	16	5	5	13	7.0%	17	9.1%	13	7.0%
1,1,1-Trichloroethane	164\187	1	436	200		28	15.0%	54	28.9%		
Carbon Tetrachloride				5	5						
Bromodichloromethane											
1,2-Dichloropropane											
Trans-1,3-Dichloropropane											
Trichloroethane	165\187	1	122	5	5	109	58.3%	119	63.6%	109	58.3%
Benzene	1\187	7	7	5	5						
Dibromochloromethane											
Bromoform											
1,1,2,2-Tetrachloroethane	16\187	2	74								
Toluene				2000**	2000						
Chlorobenzene											
Ethyl Benzene				700**	700						
Carbon Disulfide											
4-Methyl-2-Pentanone											
Ethenyl Benzene (Styrene)				100/5	100						
O-Xylene (1,2-Dimethylbenzene)											
m & p Xylene ( as m-Xylene)					10000						
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene	8\187	7	108								
Vinyl Chloride				2	2						
Tetrachloroethylene	113\187	ND	15	5**	5	9	4.8%	22	11.8%	9	4.8%

\*Safe Drinking Water Act Maximum Contaminant Level (MCL)

\*\*Proposed MCL (May, 1989)

\*\*\*Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)

Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.

ND=Nondetect

US3988

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	9/12/89 11th (2) 2708	11/28/89 16th 3146	12/5/89 17th 3012	11/6/89 17th 3110	8/21/89 17th 3120	11/6/89 17th 3141	10/25/89 18th 2601	10/25/89 18th 2603	10/25/89 18th 2604
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride			Trace	Trace					
Trichlorofluoromethane									
1,1-Dichloroethane	50.40		2.358		0.3		1.8		
1,1-Dichloroethane	40.60		Trace				1.8	3.2	
Trans-1,2-Dichloroethane	11.60		Trace						
Chloroform	9.60		0.542						
1,2-Dichloroethane									
1,1,1-Trichloroethane	352.60		21.762	1.871	2.7		29.4	38.9	<1
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropene									
Trans-1,3-Dichloropropene									
Trichloroethane	65.70		5.001	1.014	1.5		1	1.3	
Benzene									
Dibromochloromethane									
Bromofarm									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	1.60		Trace	Trace			<1	<1	

US3989

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	10/25/89 18th 2606	11/7/89 18th 3007	11/6/89 18th 3035	11/28/89 18th 3117	8/21/89 18th 3146	9/19/89 19th 2908	11/28/89 19th 3019	11/28/89 19th 3101	11/28/89 19th 3114
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride			Trace						
Trichlorofluoromethane									
1,1-Dichloroethane		4.7	Trace			1.3			
1,1-Dichloroethane	1.8	11	Trace			13.7			
Trans-1,2-Dichloroethane									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane		49.4	8.783	1.3		192.4	4.5		
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	<1	17.8	2.652	0.7		45.3	2.0		
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,3-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene		4.5	Trace				0.6		

US3990

FREQUENCY OF DETECTION: SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	11/6/89 19th 3117	11/28/89 19th 3120	11/28/89 19th 3121	8/21/89 19th 3129	9/26/89 20th 2814	9/26/89 20th 2822	9/26/89 20th 2913	9/26/89 20th 2923	9/26/89 20th 2930
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethane					<1	4.0	2.19	<1	1.4
1,1-Dichloroethane					46.8	19.5	19.2	3.1	8.0
Trans-1,2-Dichloroethane									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane	2.537				57.5	436	204.8	83.1	164.8
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,2-Dichloropropane									
Trichloroethane	1.417	0.5			121.7	112.5	44.0	8.2	21.5
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	Trace				15.1	1.9	6.49	3.8	1.51

US3991

FREQUENCY OF DETECTION: SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	11/28/89 20th 3024	11/6/89 20th 3025	11/28/89 20th 3025	8/21/89 20th 3141	11/28/89 20th 3331	9/26/89 21st 2923	9/26/89 21st 2944	9/26/89 23rd 2912	9/26/89 23rd 2927
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethane						1.3	<1	3.1	<1
1,1-Dichloroethane		2.4	2.8			2.3	6.7	34.4	5.5
Trans-1,2-Dichloroethane									
Chloroform									
1,2-Dichloroethane		0.4							
1,1,1-Trichloroethane	0.6	18.0	15.4			89.3	95.3	436	68.1
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropane									
Trichloroethene	0.9	4.1	4.3			31.4	19.9	97.1	9.0
Benzene									
Dibromochloromethane									
Bromoforn									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene		2.1	1.8			6.8	5.8	4.3	

US3992

FREQUENCY OF DETECTION: SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	10/17/89 23rd 2929	9/26/89 23rd 2931	11/7/89 23rd 3115	9/19/89 8th 2922	12/5/89 8th 2929	9/19/89 8th 2940	9/19/89 9th 2726	10/25/89 9th 2905	11/7/89 9th 3110
Chloromethane									
Bromomethane									
Chloroethane									
Methylene Chloride					Trace				
Trichlorofluoromethane									
1,1-Dichloroethene	4.7	<1					1.3	0.6	
1,1-Dichloroethane	14.8	6.0			Trace		24.2		
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane	32.4	82.2		9.3	2.880	8.5	217	7.9	3.0
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropane									
Trichloroethene	4.7	7.0		1.0	2.601	2.0	44.2	3.2	1.7
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane				47.9		1.8	11.2		
Tolulene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,3-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene			Trace		Trace			<1	

US39393



FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	11/7/89 9th 3121	12/5/89 9th 3214	12/5/89 9th 3242	10/17/89 Alpine N. 7004	10/25/89 Alton 2118	1/10/89 Bildahl 3242	10/79/89 Cannon 2801	9/12/89 Cannon 2802	9/12/89 Cannon 2810
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride		Trace	Trace						
Trichlorofluoromethane									
1,1-Dichloroethene					0.7		11.4	51.1	41.8
1,1-Dichloroethane		Trace			6.4		28.5	39.2	36.9
Trans-1,2-Dichloroethene									
Chloroform								11.2	9.5
1,2-Dichloroethane								9.0	7.2
1,1,1-Trichloroethane	3	2.550	1.755		20.4	2.5	97.5	200.0	283.2
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	2	1.663	0.586		2.7	2.0	30.5	52.7	60.6
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethynyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	0.4	Trace	Trace		1.3	<1	1.1	6.6	5.3

US3994

FREQUENCY OF DETECTION: SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	9/12/89 Cannon 2817	8/21/89 Cannon 2826	10/17/89 Cannon 2837	10/17/89 Cannon 2915	11/7/89 Cannon 2918	11/28/89 Cannon 3004	8/20/89 Hanson 2804	9/19/89 Hanson 2834	9/19/89 Hanson 2842
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene	24.7	25.0	9.4	3.4			52.5	0.7	2.9
1,1-Dichloroethane	24.0	34.0	16.3	5.8	4.8	1.5		10.2	10.9
Trans-1,2-Dichloroethene									
Chloroform	7.0	5.7							
1,2-Dichloroethane		1.8					0.9		
1,1,1-Trichloroethane	83.5	177.0	89.1	49.4	38.8	14.7	204	105.8	101
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropane									
Trichloroethene	20.7	31.0	47.1	14.3	16.2	6.3	73.4	29.6	32.6
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane								3.3	2.4
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene		23.0							
Vinyl Chloride									
Tetrachloroethylene	0.8	1.2	0.7	0.5			3.3		

US3995

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	1/10/89 Hanson 2908	10/17/89 Hanson 2911	10/17/89 Hanson 2946	9/12/89 Hanson 2633	10/17/89 Hanson 2714	9/12/89 Hanson 2802	9/12/89 Hanson 2821	9/26/89 Hanson 2901	9/26/89 Hanson 2902
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethane		2.7	6.1	14.0	17.2	48.0	32.3	<1	1.0
1,1-Dichloroethane		4.7	14.4		65.4	39.6	28.2	5.4	9.0
Trans-1,2-Dichloroethene	1.0								
Chloroform									
1,2-Dichloroethane						8.4			
1,1,1-Trichloroethane	31.0	32.1	13.4	13.9	141	287.5	200.0	49.3	97.6
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropene									
Trans-1,3-Dichloropropene									
Trichloroethane	23.0	13.3	14.8	2.7	28.3	68.5	40.0	20.3	27.5
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethynyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,3-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene		0.4	0.2	0.9	0.3	3.3	1.6	<1	1.0

US3996

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	10/17/89 Hanson 2907	11/6/89 Hanson 2938	10/17/89 Horton 2717	9/12/89 Horton 2728	9/19/89 Horton 2738	9/12/89 Horton 2741	9/12/89 Horton 2742	9/12/89 Horton 2746	9/19/89 Horton 2805
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethane	3.7		3.6	24.8	2.4	60.2	63.4	62.6	1.5
1,1-Dichloroethane	5.8	1.8	28.3	22.8	36.5	48.1	50.5	50.6	23.9
Trans-1,2-Dichloroethane									
Chloroform				7.1		13.5	14.0	14.0	
1,2-Dichloroethane				5.6		11.6	13.2	13.6	
1,1,1-Trichloroethane	49.7	16.7	16.0	78.6	411.6	100.0	434.3	400.0	218.4
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	14.3	6.2	1.7	2.7	92.8	68.1	75.8	64.3	43.1
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane					53.9				2.1
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)							108.4		
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	0.4		0.5			8.6	4.3	2.6	

US3997

FREQUENCY OF DETECTION - SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	10/17/89 Horton 2811	9/12/89 Horton 2818	9/19/89 Horton 2834	9/19/89 Horton 2835	9/19/89 Horton 2838	10/17/89 Horton 2905	10/17/89 Horton 2942	11/28/89 Horton 3001	11/7/89 Horton 3133
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethane	26.2	29.5	2.8	1.0	1.3	9.4	4.2		
1,1-Dichloroethane	62.3	35.6	27.5	13.3	22.2	44.8	7.5	4.4	
Trans-1,2-Dichloroethene									
Chloroform		1.2							
1,2-Dichloroethane		7.4							
1,1,1-Trichloroethane	249.0	205.1	228.0	197.3	218.8	133.0	13.7	30.1	2.6
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropene									
Trans-1,3-Dichloropropene									
Trichloroethene	47.6	57.6	54.1	26.9	51.9	51.6	12.6	8.7	1.5
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane			56.1	36.7					
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	3.8	3.2				1.2	0.4	1.8	

US3998

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	11/28/89	10/25/89	8/20/89	9/12/89	10/17/89	9/19/89	9/19/89	10/25/89	10/17/89
	Horton 3037	Horton 2924	Kinsey 2726	Kinsey 2803	Kinsey 2808	Kinsey 2813	Kinsey 2822	Kinsey 2826	Kinsey 2829
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane		1.8						18.9	
1,1-Dichloroethene		3.2	53.9	34.3	23.5	0.9	0.8	51.9	8.3
1,1-Dichloroethane				30.9	50.2	15.1	13.8		14.7
Trans-1,2-Dichloroethene									
Chloroform				8.4					
1,2-Dichloroethane			1.0	5.2					
1,1,1-Trichloroethane	1.1	26.5	161.0	219.0	197.0	193.2	182.6	193.8	94.3
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	0.9	8.5	63.8	24.1	50.8	20.4	28.2	58.9	15.1
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane						20.0	4.2		
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (m m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene		<1	1.8	1.5	1.3			3.5	0.2

US3999

FREQUENCY OF DETECTION - SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	1/10/89 Kinsey 2829	9/19/89 Kinsey 2833	6/20/89 Kinsey 2909	10/17/89 Kinsey 2920	11/7/89 Kinsey 3002	9/26/89 Lapey 2746	9/12/89 Lapey 2817	9/19/89 Lapey 2838	9/26/89 Lapey 2918
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene		0.8	3.5	2.3	0.9	2.7	23.6	0.5	
1,1-Dichloroethane		12.6		3.9		25.2	17.5	6.5	
Trans-1,2-Dichloroethene	3.0								
Chloroform							6.4		
1,2-Dichloroethane			0.2				2.9		
1,1,1-Trichloroethane	37.0	81.0	13.9	29.1	10.6	224.2	114.2	50.6	1.5
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethane	35.0	20.9	7.0	7.5	2.8	50.0	21.0	17.5	<1
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,3-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene			0.2	0.2		4.1			

US4000

FREQUENCY OF DETECTION- SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	1/7/89 Lapey 3116	11/7/89 Lapey 3117	11/7/89 Lapey 3121	11/7/89 Lapey 3125	11/7/89 Lapey 3130	11/28/89 Lindberg 2402	11/6/89 Lindberg 2407	11/28/89 Lindberg 2501	1/28/89 Lindberg 2506
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethane									
1,1-Dichloroethane							Trace		
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane	3.0	2.7	2.7	3.8	4.5		0.634	0.8	6.0
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropene									
Trans-1,3-Dichloropropene									
Trichloroethene	1.3	1.8	1.9	2.1	2	0.6	1.609	1.4	2.9
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene							Trace		0.8

US4001



FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	12/5/89 Lindberg 2512	11/6/89 Lindberg 2515	11/6/89 Lindberg 2518	6/20/89 Lindale 2412	6/20/89 Lindale 2424	11/6/89 Lindale 2612	10/17/89 Marshall 2845	11/7/89 Marshall 2641	9/12/89 Marshall 2722
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride	Trace		Trace						
Trichlorofluoromethane									
1,1-Dichloroethane	0.786	0.595	1.184				11.9		13.3
1,1-Dichloroethane	Trace						26.9	13.4	12.4
Trans-1,2-Dichloroethene	Trace								
Chloroform									3.9
1,2-Dichloroethane									
1,1,1-Trichloroethane	5.464	3.684	11.159	1.5	2.2	1.686	93.6	157	54.0
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	2.856	2.223	4.232	0.7	1.3	1.269	47.9	7.7	4.1
Benzene				6.5					
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,3-Dichloroethylenes									
Vinyl Chloride									
Tetrachloroethylenes	Trace	Trace	Trace	0.3	1.0	Trace	0.9	1.4	<1

US4002

FREQUENCY OF DETECTION -SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	11/28/89 Marshall 2734	11/28/89 Marshall 273	10/17/89 Marshall 2745	8/21/89 Marshall 2813	9/19/89 Marshall 2825	9/19/89 Marshall 2830	8/21/89 Marshall 2838	9/19/89 Marshall 2909	2/7/89 Marshall 2926
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethane	19.2		30.0	38.0	1.6	1.1	36.0	1.2	
1,1-Dichloroethane	80.9		67.6	34.0	30.0	18.7	39.0	8.8	
Trans-1,2-Dichloroethene							1.1		2.0
Chloroform				7.0			7.0		
1,2-Dichloroethane				3.1			2.9		
1,1,1-Trichloroethane	170.5	1.8	295.0	154	246	208.4	187.0	98.1	24.0
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	37.5		82.9	35.0	58.2	40.1	44.0	32.6	57.0
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane					74.0	3.2		23.1	
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,3-Dichloroethyene	50.6			26.0			27.0		
Vinyl Chloride									
Tetrachloroethylene		0.5	3.9	1.7					

US4003

FREQUENCY OF DETECTION: SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	10/17/89 Marshall 2937	10/17/89 Marshall 2946	10/25/89 Marshall 3016	10/25/89 Marshall 3034	2/7/89 Marshall 3101	9/12/89 Potter 2700	9/19/89 Potter 2825	10/25/89 Potter 2826	8/21/89 Potter 2837
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene	2.3	1.1	1.4	0.09		32.2	0.9	9.1	20.0
1,1-Dichloroethane	6.5	1.8	3.1	3.7		25.2	15.8	10.2	25.0
Trans-1,2-Dichloroethene						6.7			
Chloroform						6.9			4.6
1,2-Dichloroethane									1.4
1,1,1-Trichloroethane	7.0	13.8	13.1	0.5	<1	111.8	192.5	93.1	113.0
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	5.2	5.0	4.0	2.3	2.0	23.4	40.8	27.5	24.0
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane							28.0		
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,3-Dichloroethylene									18.0
Vinyl Chloride									
Tetrachloroethylene		0.2	1.6			2.2		<1	1.2

US4004

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	11/28/89 Potter 2933	10/25/89 Sewell 2718	9/12/89 Sewell 2814	9/12/89 Sewell 2822	9/19/89 Sewell 2826	6/20/89 Sewell 2902	9/26/89 Sewell 2909	2/7/89 Sewell 2909	9/28/89 Sewell 2917
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene		3.2	51.0	49.0	1.1	10.9			<1
1,1-Dichloroethane	2.9	27.2	55.6	54.2	18.8		6.7		4.9
Trans-1,2-Dichloroethene				2.2				2.0	
Chloroform	0.6		11.5	11.7					
1,2-Dichloroethane	0.3	15.6	9.1	9.2					
1,1,1-Trichloroethane	29.8		90.0	210.0	215.0	38.9	88.9	36.0	38.6
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	12.0	1.8	73.7	73.2	47.9	21.8	25.1	22.0	28.1
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane					32.3				
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	0.6	0.6	5.0	6.7		0.3	1.1	1.0	

US4005

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	9/26/89 Sewell 2921	9/26/89 Sewell 2930	8/21/89 Sewell 2930	12/25/89 Sewell 2934	9/26/89 Sewell 2938	9/26/89 Sewell 2938	9/26/89 Sewell 2976	10/25/89 Sewell 3016	10/25/89 Sewell 3026
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene	<1	<1	5.9	3.2	<1	<1			4.4
1,1-Dichloroethane	4.4	4.6	7.3	7.3	6.8	6.8	9.9		19.0
Trans-1,2-Dichloroethene			1.1						
Chloroform			2.0						
1,2-Dichloroethane			0.7						
1,1,1-Trichloroethane	107.3	111.2	28.0	48.0	82.9	82.9	102.5	<1	7.7
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethane	19.5	19.8	13.0	17.8	18.5	18.5	30.6		9.9
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethynyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene			6.9						
Vinyl Chloride									
Tetrachloroethylene	1.0	1.4	1.0	1.5	<1	<1	1.6		<1

US4006

FREQUENCY OF DETECTION - SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	10/25/89 Sewell 3040	11/7/89 Sewell 3136	11/7/89 Sewell 3138	11/7/89 Sewell 3142	9/12/89 Wills 1201	10/25/89 Wills 1610	11/7/89 Wills 1703	9/12/89 Wills 1920	8/21/89 Wills 1935
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene	0.9					12.8	42.8	49.2	30.0
1,1-Dichloroethane	1.5					33.6	37	39.7	55.0
Trans-1,2-Dichloroethene									1.1
Chloroform								11.8	11.0
1,2-Dichloroethane								9.8	3.4
1,1,1-Trichloroethane	8.6	3.9	3.4	3.0	1.50	133	220	260	210
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	3.4	2.3	2.1	1.8	<1	37.5	73.9	50.0	45.0
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									42.0
Vinyl Chloride									
Tetrachloroethylene	0.9		<1		<1	0.9	1.7	4.3	2.1

US4007

## IDPH 1989 (Dataset #1)

Parameter	12/5/89 Brooke 1004	11/6/89 Brooke 1113	12/5/89 Collins 3310	11/6/89 Hamilton 1709	11/6/89 Hamilton 1717	12/6/89 Johnson 1613	12/5/89 Johnson 1638	12/5/89 Johnson 1746	12/5/89 Lyan 1738
Chloromethane									
Bromomethane									
Chloroethane									
Methylene Chloride	Trace		Trace		Trace		Trace	Trace	
Trichlorofluoromethane									
1,1-Dichloroethane									
1,1-Dichloroethane	Trace		Trace						
Trans-1,2-Dichloroethane									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane	1.905	2.6	2.173	1.616	1.782				
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,2-Dichloropropane									
Trichloroethane	0.545	0.8	0.868	0.55	1.042				
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
3-Pentanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	Trace		Trace	Trace	Trace		Trace	Trace	

US4008

FREQUENCY OF DETECTION- SOUTHEAST ROCKFORD

IDPH 1989 (Dataset #1)

Parameter	11/6/89 Pershing 1637	12/5/89 Sandy Hillw 1734	12/5/89 Sandy Hillw 1810	12/5/89 Sandy Hillw 1812	12/5/89 Sandy Hillw 2701	10/25/89 Reed 1825	10/25/89 Reed 1930
Chloromethane							
Bromomethane							
Chloroethane							
Methylene Chloride		Trace	Trace	Trace	Trace		
Trichlorofluoromethane							
1,1-Dichloroethane						8.5	12.8
1,1-Dichloroethane		Trace				14.4	46.3
Trans-1,2-Dichloroethane							
Chloroform							
1,2-Dichloroethane							
1,1,1-Trichloroethane	4.057					92.1	93
Carbon Tetrachloride							
Bromodichloromethane							
1,2-Dichloropropane							
Trans-1,2-Dichloropropane							
Trichloroethane	2.107					35	46.6
Benzene							
Dibromodichloromethane							
Bromoform							
1,1,2,2-Tetrachloroethane							
Toluene							
Chlorobenzene							
Ethyl Benzene							
Carbon Disulfide							
4-Methyl-2-Pentanone							
Ethanyl Benzene							
O-Xylene (1,2-Dimethylbenzene)							
m & p Xylene (as m Xylene)							
2-Butanone (Methyl Ethyl Ketone)							
Cis-1,2-Dichloroethylene							
Vinyl Chloride							
Tetrachloroethylene				Trace	Trace	0.5	1.5

US4009



**IDPH DECEMBER 1989  
DATASET #2**

**US4010**

# Summary of Historical Sampling Results

Source: IDPH

Year: 1989 (December)

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l)		MCL* (ug/l)	PRS*** (ug/l)	SAMPLES ≥ MCL		SAMPLES ≥ 50% MCL		SAMPLES ≥ PRS	
		Minimum	Maximum			#	%	#	%	#	%
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride	3\80										
Trichlorofluoromethane											
1,1-Dichloroethene	15\80	1	30	7	7	3	3.8%	6	7.5%	3	3.8%
1,1-Dichloroethane	21\80	1	78								
Trans-1,2-Dichloroethene	10\80										
Chloroform	8\80	1	5								
1,2-Dichloroethane	12\80	1	23	5	5	1	1.3%	3	3.8%	1	1.3%
1,1,1-Trichloroethane	40\80	ND	159	200		0	0.0%	3	3.8%		
Carbon Tetrachloride	2\80	2	27	5	5	1	1.3%	1	1.3%	1	1.3%
Bromodichloromethane	1\80	2	2								
1,2-Dichloropropane											
Trans-1,3-Dichloropropene											
Trichloroethene	42\80	ND	58	5	5	9	11.3%	12	15.0%	9	11.3%
Benzene	1\80	7	7	5	5	1	1.3%	1	1.3%	1	1.3%
Dibromochloromethane											
Bromoform											
1,1,2,2-Tetrachloroethane											
Toluene				2000**	2000						
Chlorobenzene											
Ethyl Benzene	1\80			700**	700						
Carbon Disulfide											
4-Methyl-2-Pentanone											
Ethynyl Benzene (Styrene)				100\5	100						
O-Xylene (1,2-Dimethylbenzene)											
m & p Xylene ( as m-Xylene)					10000						
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene	3\80	3	65								
Vinyl Chloride				2	2						
Tetrachloroethylene	39\80	ND	7	5**	5	1	1.3%	3	3.8%	1	1.3%

\*Safe Drinking Water Act Maximum Contaminant Level (MCL)

\*\*Proposed MCL (May, 1989)

\*\*\*Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)

Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.

ND=Nondetect

US4011

FREQUENCY OF DETECTION- SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/4/89 Bldahl 3029	12/4/89 Bldahl 3221	12/4/89 Bldahl 3237	12/12/89 Bldahl 3318	12/12/89 Bldahl 3324	12/12/89 Carleon 3006	12/4/89 Collins 3201	12/4/89 Collins 3202	12/4/89 Collins 3230
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethane									
1,1-Dichloroethane			0.5						
Trans-1,2-Dichloroethane									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane		1.3	1.0				4.7	3.7	1.3
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropane									
Trichloroethane	0.3	1.3	0.8			0.9	2.8	1.1	0.4
Benzene	7.1								
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethonyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene						Trace	4.8	6.5	1.5

US4012

FREQUENCY OF DETECTION SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/4/89 Collins 3234	12/12/89 Collins 3317	12/11/89 Ed Vera 3414	12/11/89 Ed Vera 3425	12/11/89 Fruitland 3090	12/12/89 Harrison 2313	12/4/89 Johnson 1631	12/11/89 Johnson 1637	12/11/89 Johnson 1641
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene						0.7			
1,1-Dichloroethane									
Trans-1,2-Dichloroethene		Trace							
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane		2.7				12.3			
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	0.6	1.1							
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,3-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	0.8	Trace				Trace			

US4013

FREQUENCY OF DETECTION: SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/11/89 Johnson 1842	12/11/89 Johnson 1711	12/11/89 Johnson 1728	12/12/89 Kishwaukee 3711	12/12/89 Lapey 3038	12/12/89 Lapey 3205	12/12/89 Lapey 3230	12/4/89 Lapey 3245	12/11/89 Lund 2426
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene									
1,1-Dichloroethane				Trace	Trace				
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane				0.6	2.980	2.731		0.7	
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene				0.9	1.673	1.6			
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene				Trace	Trace	Trace			

USA014

FREQUENCY OF DETECTION: SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/11/89 Lund 2517	12/11/89 Lund 2526	12/11/89 Lyan 1645	12/11/89 Lyan 1650	12/11/89 Lyan 1714	12/14/89 Main 2921	12/4/89 Marshall 2721	12/4/89 Marshall 2730	12/14/89 Marshall 2813
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethane							4.6	28.6	
1,1-Dichloroethane							31.6	77.9	
Trans-1,2-Dichloroethane									
Chloroform								4.7	
1,2-Dichloroethane									
1,1,1-Trichloroethane							18.1	108.0	
Carbon Tetrachloride									
Bromodichloromethane							1.5		
1,2-Dichloropropane									
Trans-1,2-Dichloropropane									
Trichloroethene							1.8	23.7	
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (m & p Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene							13.5	64.5	
Vinyl Chloride									
Tetrachloroethylene						Trace			Trace

US4015

FREQUENCY OF DETECTION- SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/12/89 Marshall 3138	12/14/89 Pershing 1802	12/11/89 Sandy Hillw 1715	12/14/89 Sandy Hillw 1816	12/12/89 Sandy Hillw 2413	12/14/89 Sandy Hillw 3211	12/11/89 Southworth 3433	12/4/89 7th 3133	12/4/89 7th 3209
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethene		1.285							
1,1-Dichloroethane		Trace							
Trans-1,2-Dichloroethene		Trace							
Chloroform									
1,2-Dichloroethane		1.158							
1,1,1-Trichloroethane	2.6					1.890		1.7	2.9
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethene	1.7	2.376				0.954		0.6	0.9
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Tolulene									
Chlorobenzene									
Ethyl Benzene		Trace							
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,3-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	Trace				Trace			0.2	3.3

US4016

FREQUENCY OF DETECTION - SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/4/89 7th 3217	12/4/89 7th 3241	12/8/89 7th 3317	12/8/89 8th 2810	12/12/89 8th 3330	12/8/89 9th 3018	12/14/89 9th 3125	12/4/89 9th 3137	12/12/89 9th 3238
Chloromethane									
Bromomethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethane				2.822					
1,1-Dichloroethane				Trace					
Trans-1,2-Dichloroethane				Trace					
Chloroform				0.711					
1,2-Dichloroethane				22.525	1.311	0.607	2.388	3.9	1.7
1,1,1-Trichloroethane	1.2	0.4	1.978						
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropene									
Trichloroethane	0.2		0.907	5.644			1.532	1.4	
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	0.9	0.7	Trace	Trace		Trace	Trace	1.0	Trace

US4017



FREQUENCY OF DETECTION: SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/12/89 9th 3321	12/12/89 9th 3326	12/4/89 10th 3125	12/4/89 10th 3142	12/5/89 10th 3201	12/12/89 10th 3209	12/12/89 10th 3210	12/12/89 10th 3236	12/5/89 10th 3245
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride					Trace		Trace		Trace
Trichlorofluoromethane									
1,1-Dichloroethene					Trace		Trace		
1,1-Dichloroethane					Trace		Trace	Trace	
Trans-1,2-Dichloroethene									
Chloroform									
1,2-Dichloroethane									
1,1,1-Trichloroethane			2.8	2.8	3.374		2.567	1.693	1.597
Carbon Tetrachloride									
Bromodichloromethane									
1,2-Dichloropropane									
Trans-1,3-Dichloropropane									
Trichloroethene				2.1	2.055		1.457	0.894	0.618
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene		Trace		1.5	Trace		Trace	Trace	Trace

US4018

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/12/89 11th 2707	12/12/89 11th 2734	12/12/89 11th 2744	12/12/89 11th 2834	12/12/89 11th 2837	12/12/89 11th 2842	12/12/89 11th 2901	12/12/89 11th 2926	12/12/89 11th 2942
Chloromethane									
Bromoethane									
Chloroethane									
Methylene Chloride									
Trichlorofluoromethane									
1,1-Dichloroethane	2.490	29.998	30.03		4.767	3.584	Trace	1.027	0.956
1,1-Dichloroethane	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace
Trans-1,2-Dichloroethane	Trace	Trace	Trace		Trace	Trace		Trace	Trace
Chloroform		3.833	3.736	1.175	1.067	0.746	0.621		
1,2-Dichloroethane	0.504	1.612	1.646	0.522			Trace		
1,1,1-Trichloroethane	5.885	152.800	158.8	41.7	37.0	29.8	23.85	10.544	9.675
Carbon Tetrachloride	1.914	27.249							
Bromodichloromethane									
1,2-Dichloropropene									
Trans-1,3-Dichloropropene									
Trichloroethene	1.614	55.400	57.7	18.584	17.182	14.810	9.293	4.397	3.582
Benzene									
Dibromochloromethane									
Bromoform									
1,1,2,2-Tetrachloroethane									
Toluene									
Chlorobenzene									
Ethyl Benzene									
Carbon Disulfide									
4-Methyl-2-Pentanone									
Ethyl Benzene									
O-Xylene (1,2-Dimethylbenzene)									
m & p Xylene (as m Xylene)									
2-Butanone (Methyl Ethyl Ketone)									
Cis-1,2-Dichloroethylene									
Vinyl Chloride									
Tetrachloroethylene	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	

US4019

FREQUENCY OF DETECTION - SOUTHEAST ROCKFORD

IDPH 1989

Parameter	12/12/89 11th 3132	12/11/89 18th 3414	12/11/89 18th 3110	12/11/89 18th 3510	12/4/89 Brooke 1317	12/4/89 Kinsey 2929	12/4/89 Sewell 3133	12/4/89 20th 3110
Chloromethane								
Bromoethane								
Chloroethane								
Methylene Chloride								
Trichlorofluoromethane								
1,1-Dichloroethane								
1,1-Dichloroethane	Trace					2.1		
Trans-1,2-Dichloroethane								
Chloroform								
1,2-Dichloroethane								
1,1,1-Trichloroethane	3.186		2.2		3.2	11.4		2.3
Carbon Tetrachloride								
Bromodichloromethane								
1,2-Dichloropropane								
Trans-1,3-Dichloropropane								
Trichloroethane	2.087				1.0	5.0		2.9
Benzene								
Dibromochloromethane								
Bromoform								
1,1,1,2-Tetrachloroethane								
Toluene								
Chlorobenzene								
Ethyl Benzene								
Carbon Disulfide								
4-Methyl-2-Pentanone								
Ethyl Benzene								
O-Xylene (1,2-Dimethylbenzene)								
m & p Xylene (as m Xylene)								
2-Butanone (Methyl Ethyl Ketone)								
Cis-1,2-Dichloroethylene						2.9		
Vinyl Chloride								
Tetrachloroethylene	Trace							

US4020

IDPH 1988

US4021

# Summary of Historical Sampling Results

Source: IDPH  
Year: 1988

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l)		MCL* (ug/l)	PRS*** (ug/l)	SAMPLES ≥ MCL		SAMPLES ≥ 50% MCL		SAMPLES ≥ PRS	
		Minimum	Maximum			#	%	#	%	#	%
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride											
Trichlorofluoromethane	8\17	ND	4	7	7	0	0.0%	1	5.9%	0	0.0%
1,1-Dichloroethane	8\17	ND	25								
1,1-Dichloroethane											
Trans-1,2-Dichloroethane	9\17	ND	7								
Chloroform	1\17			5	5						
1,2-Dichloroethane	13\17	2	140	200		0	0.0%	2	11.8%		
1,1,1-Trichloroethane	1\17			5	5						
Carbon Tetrachloride	1\17										
Bromodichloromethane											
1,2-Dichloropropane											
Trans-1,3-Dichloropropane	12\17	1	140	5	5	8	47.1%	10	58.8%	8	47.1%
Trichloroethane				5	5						
Benzene	1\17										
Dibromochloromethane											
Bromoform											
1,1,2,2-Tetrachloroethane				2000**	2000						
Toluene											
Chlorobenzene				700**	700						
Ethyl Benzene											
Carbon Disulfide											
4-Methyl-2-Pentanone				100\5	100						
Etheryl Benzene (Styrene)											
O-Xylene (1,2-Dimethylbenzene)					10000						
m & p Xylene (as m-Xylene)											
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene				2	2						
Vinyl Chloride											
Tetrachloroethylene	11\17	ND	14	5**	5	1	5.9%	6	35.3%	1	5.9%

\*Safe Drinking Water Act Maximum Contaminant Level (MCL)

\*\*Proposed MCL (May, 1989)

\*\*\*Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)

Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.

ND=Nondetect

US4022

FREQUENCY OF DETECTION--SOUTHEAST ROCKFORD (GC-MS)

IDPH 1988

Parameter	8/00/88	9/8/88	9/8/88	9/13/88	8/8/88	10/16/88	9/9/88	8/9/88	8/9/88	8/9/88
	Cannon 2741	Cannon 2842	Cannon 2904	Hanson 2804	Horton 2922	Horton 2922	Horton 2926	Horton 3006	Lindberg 2413	Lindberg 2421
Chloromethane										
Bromoethane										
Chloroethane										
Methylene Chloride										
Trichlorofluoromethane										
1,1-Dichloroethene	2.0	1.2	1.4	3.8	1.3		1.1			
1,1-Dichloroethane	13.0	11.0	2.0	25.0	11.0		9.1			
Trans-1,2-Dichloroethene										
Chloroform	4.5		1.5	4.7	0.6	3.0	2.7	7.0		
1,2-Dichloroethane								1.7		
1,1,1-Trichloroethane	140.0	86.0	56.0	98.0	110.0	3.0	23.0	1.8	2.1	
Carbon Tetrachloride								0.9		
Bromodichloromethane								3.6		
1,2-Dichloropropane										
Trans-1,3-Dichloropropene										
Trichloroethane	140.0	40.0	6.4	68.0	51.0		12.0	2.7	1.1	0.7
Benzene										
Dibromochloromethane								7.0		
Bromoform										
1,1,2,2-Tetrachloroethane										
Toluene										
Chlorobenzene										
Ethyl Benzene										
Carbon Disulfide										
4-Methyl-2-Pentanone										
Ethynyl Benzene										
O-Xylene (1,2-Dimethylbenzene)										
m & p Xylene (as m Xylene)										
2-Butanone (Methyl Ethyl Ketone)										
Cis-1,2-Dichloroethylene										
Vinyl Chloride										
Tetrachloroethylene	4.8	0.9	0.2	3.2	2.0	Trace	2.7	2.6		

US4023

FREQUENCY OF DETECTION-SOUTHEAST ROCKFORD (GC-MS)

IDPH 1988

Parameter	8/9/88 Lindberg 2618	8/9/89 Lund 2526	8/9/89 Ralph 7232	8/9/88 Sewell 2722	8/9/88 8th 3219	8/9/88 10th 3221	8/9/88 11th 2626
Chloromethane							
Bromoethane							
Chloroethane							
Methylene Chloride							
Trichlorofluoromethane							
1,1-Dichloroethene	0.4				0.1		0.5
1,1-Dichloroethane	1.0			0.2			8.7
Trans-1,2-Dichloroethene							
Chloroform	0.6				0.3		2.5
1,2-Dichloroethane							
1,1,1-Trichloroethane	16.0			3.2	4.8	1.7	94.0
Carbon Tetrachloride							
Bromochloromethane							
1,2-Dichloropropane							
Trans-1,2-Dichloropropane							
Trichloroethene	6.1			0.5	2.8		20.0
Benzene							
Dibromochloromethane							
Bromoform							
1,1,2,2-Tetrachloroethane							
Toluene							
Chlorobenzene							
Ethyl Benzene							
Carbon Disulfide							
4-Methyl-2-Pentanone							
Ethyl Benzene							
O-Xylene (1,3-Dimethylbenzene)							
m & p Xylene (m,p Xylene)							
2-Butanone (Methyl Ethyl Ketone)							
Cis-1,2-Dichloroethene							
Vinyl Chloride							
Tetrachloroethene	2.9				14.0	0.7	

US4024

INORGANIC ANALYSIS DATA SHEET  
METALSLab Name: ARDL, Inc.EPA Sample No.: 6101DMatrix (soil/water): waterLab Sample ID: 200066-1

Level (low/med): \_\_\_\_\_

Date Received: 8/30/98

% Solids: \_\_\_\_\_

*Barrett's mobile home*Concentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	M	Q
7429-90-5	Aluminum	[130]		P	
7440-36-0	Antimony	454		P	
7440-38-2	Arsenic	14		BH	
7440-39-3	Barium	[31]		P	
7440-41-7	Beryllium	14		P	
7440-43-9	Cadmium	54		P	
7440-70-2	Calcium	76,300		P	
7440-47-3	Chromium	94		P	
7440-48-4	Cobalt	104		P	
7440-50-8	Copper	39		P	
7439-89-6	Iron	564		P	
7439-92-1	Lead	25		F	
7439-95-4	Magnesium	34,900		P	
7439-96-5	Manganese	24		P	
7439-97-6	Mercury	0.54		CV	
7440-02-0	Nickel	254		P	
7440-09-7	Potassium	[2000]		P	
7782-49-2	Selenium	24		BH	
7440-22-4	Silver	74		P	
7440-23-5	Sodium	32,000		P	
7440-23-0	Thallium	54		F	
7440-62-2	Vanadium	154		P	
7440-66-6	Zinc	84		P	

RECEIVED

SEP 12 1988

EPA-DLPC

Color Before: \_\_\_\_\_ Clarity Before: \_\_\_\_\_ Texture: \_\_\_\_\_

Color After: \_\_\_\_\_ Clarity After: \_\_\_\_\_ Artifacts: \_\_\_\_\_



Concentration Units ( $\mu\text{g/L}$  or  $\text{mg/kg}$  dry weight):  $\mu\text{g/L}$

[illegible]

US4026

INORGANIC ANALYSIS DATA SHEET  
METALS

Lab Name: ARDL, Inc. IEPA Sample No.: G1015  
 Matrix (soil/water): water Lab Sample ID: 2000060-2  
 Level (low/med): \_\_\_\_\_ Date Received: 8/30/99  
 % Solids: \_\_\_\_\_

Barrett's

Concentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	M	Q
7429-90-5	Aluminum	224		P	
7440-36-0	Antimony	117		P	
7440-38-2	Arsenic	10.5		BH	
7440-39-3	Barium	59		P	
7440-41-7	Beryllium	14		P	
7440-43-9	Cadmium	14.0		P	
7440-70-2	Calcium	96,100		P	
7440-47-3	Chromium	94		P	
7440-48-4	Cobalt	104		P	
7440-50-8	Copper	77		P	
7439-89-6	Iron	504		P	
7439-92-1	Lead	24		F	
7439-95-4	Magnesium	48,900		P	
7439-96-5	Manganese	[11]		P	
7439-97-6	Mercury	0.54		CV	
7440-02-0	Nickel	254		P	
7440-09-7	Potassium	[2100]		P	
7782-49-2	Selenium	6		BH	
7440-22-4	Silver	74		P	
7440-23-5	Sodium	67,000		P	
7440-29-0	Thallium	54		F	
7440-62-2	Vanadium	154		P	
7440-66-6	Zinc	84		P	

Color Before: \_\_\_\_\_ Clarity Before: \_\_\_\_\_ Texture: \_\_\_\_\_  
 Color After: \_\_\_\_\_ Clarity After: \_\_\_\_\_ Artifacts: \_\_\_\_\_

Concentration Units (ug/L or mg/kg dry weight): mg/L

[illegible]

Color Before: \_\_\_\_\_ Clarity Before: \_\_\_\_\_ Texture: \_\_\_\_\_  
Color After: \_\_\_\_\_ Clarity After: \_\_\_\_\_ Defects: \_\_\_\_\_

INORGANIC ANALYSIS DATA SHEET  
METALSLab Name: ARDL, Inc.IEPA Sample No.: G102Matrix (soil/water): waterLab Sample ID: 200046-3

Level (low/med): \_\_\_\_\_

Date Received: 8/30/88

% Solids: \_\_\_\_\_

BarretsConcentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	M	Q
7429-90-3	Aluminum	220		P	
7440-36-0	Antimony	70		P	
7440-38-2	Arsenic	12		BH	
7440-39-3	Barium	44		P	
7440-41-7	Beryllium	14		P	
7440-43-9	Cadmium	5		P	
7440-70-2	Calcium	81,400		P	
7440-47-3	Chromium	94		P	
7440-48-4	Cobalt	104		P	
7440-50-8	Copper	57		P	
7439-89-6	Iron	504		P	
7439-92-1	Lead	.31		F	
7439-95-4	Magnesium	36,300		P	
7439-96-5	Manganese	94		P	
7439-97-6	Mercury	0.54		CV	
7440-02-0	Nickel	254		P	
7440-09-7	Potassium	[3200]		P	
7782-49-2	Selenium	4		BH	
7440-22-4	Silver	74		P	
7440-23-5	Sodium	46,000		P	
7440-28-0	Thallium	54		F	
7440-62-2	Vanadium	154		P	
7440-66-6	Zinc	84		P	

Color Before: \_\_\_\_\_ Clarity Before: \_\_\_\_\_ Texture: \_\_\_\_\_

Color After: \_\_\_\_\_ Clarity After: \_\_\_\_\_ Artifacts: \_\_\_\_\_

IEPA Sample No.: 6102

Lab Sample ID: 200066-3

Date Received: 8/30/98

Concentration Units (ug/L or mg/kg dry weight): ug/L

[illegible]

Color After: \_\_\_\_\_ Clarity After: \_\_\_\_\_ Artifacts: \_\_\_\_\_

INORGANIC ANALYSIS DATA SHEET  
METALSLab Name: ARDL, Inc.EPA Sample No.: 6103Matrix (soil/water): waterLab Sample ID: 2000 46-4

Level (low/Med): \_\_\_\_\_

Date Received: 8/30/88

% Solids: \_\_\_\_\_

BarretsConcentration Units (ug/L or mg/kg dry weight): ug/L

CAS No.	Analyte	Concentration	C	M	Q
7429-90-5	Aluminum	[130]		P	
7440-36-0	Antimony	86		P	
7440-38-2	Arsenic	1		BH	
7440-39-3	Barium	[27]		P	
7440-41-7	Beryllium	14		P	
7440-43-9	Cadmium	0		P	
7440-70-2	Calcium	81,800		P	
7440-47-3	Chromium	9		P	
7440-48-4	Cobalt	104		P	
7440-50-8	Copper	53		P	
7439-89-6	Iron	504		P	
7439-92-1	Lead	11		F	
7439-95-4	Magnesium	40,900		P	
7439-96-3	Manganese	94		P	
7439-97-6	Mercury	0.54		CV	
7440-02-0	Nickel	254		P	
7440-09-7	Potassium	[2100]		P	
7782-49-2	Selenium	24		BH	
7440-22-4	Silver	74		P	
7440-23-5	Sodium	26,000		P	
7440-28-0	Thallium	54		F	
7440-62-2	Vanadium	154		P	
7440-66-6	Zinc	84		P	

Color Before: \_\_\_\_\_ Clarity Before: \_\_\_\_\_ Texture: \_\_\_\_\_  
 Color After: \_\_\_\_\_ Clarity After: \_\_\_\_\_ Artifacts: \_\_\_\_\_

6103

Lab Sample ID: 200066-4

Date Received: 8/30/55

1 Solids: \_\_\_\_\_

Concentration Units (ug/L or mg/kg dry weight): ug/L

[illegible]

Color After: \_\_\_\_\_ Clarity After: \_\_\_\_\_ Anticlastic: \_\_\_\_\_

**APPENDIX B**  
**CLP SAS REQUEST FORMS**



U.S. Environmental Protection Agency  
CLP Sample Management Office  
P.O. Box 818, Alexandria, Virginia 22313  
PHONE: (703)/557-2490 or FTS/557-2490

SAS Number

SPECIAL ANALYTICAL SERVICES  
Client Request

☒ Regional Transmittal ☐ Telephone Request

- A. EPA Region/Client: Region V
- B. RSCC Representative: Jan Pels
- C. Telephone Number: (312) 353-2720
- D. Date of Request: May 1990
- E. Site Name: Southeast Rockford Operable Unit

Please provide below a description of your request for Special Analytical Services under the Contract Laboratory Program. In order to most efficiently obtain laboratory capability for your request, please address the following considerations, if applicable. Incomplete or erroneous information may result in delay in the processing of your request. Please continue response on additional sheets, or attach supplementary information as needed.

1. General description of analytical service requested: Analysis of Drinking Water and/or residential well water for Arsenic, Cadmium, Chromium and Lead using detection limits lower than SOW 7/88 (See Attachment II). Arsenic, Cadmium and Lead are to be determined by GFAA using the method of standard additions. GFAA analysis of samples free of particulates may be conducted on the undigested sample. Chromium will be determined by ICP.
2. Definition and number of work units involved (specify whether whole samples or fractions; whether organics or inorganics; whether aqueous or soil and sediments; and whether low, medium, or high concentration):  
144 Residential, 10 Industrial and 1 Public Well water investigative samples, 17 field blanks, 17 field duplicates, will be collected over a 2 week period. Samples are water samples.
3. Purpose of analysis (specify whether Superfund (Remedial or Enforcement), RCRA, NPDES, etc.):  
Superfund Remedial State Lead
4. Estimated date(s) of collections: June 4 to June 16, 1990 (Attachment I)
5. Estimated date(s) and method of shipment: Daily from June 4 to June 16 - Federal Express

6. Number of days analysis and data required after laboratory receipt of samples:

21 days

7. Analytical protocol required (attach copy if other than a protocol currently used in this program:

Inorganic analysis as per SOW 7/88, with the exceptions listed in Attachments II and III. ICP emission spectroscopy analysis follows the SOW mentioned above for sample preparation and analysis protocol with the instrument detection limits and matrix spike levels given in Attachment II and the QC audits as described in Attachment III. GFAA analyses may be run undigested if the samples are free of particulates. If particulates are present the samples are to be digested as per SOW mentioned above. A detailed set of instructions for conducting the GFAA analyses are included in Attachment III. Special instrument detection limits and matrix spike levels are listed on Attachment II.

8. Special technical instruction (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.): 1) Check the pH of each sample (wide range pH paper is acceptable). If the pH values are outside of the specified limits of SOW, contact Region V for instructions. 2) Instrument Detection limits (IDL) of Attachment II are to be met prior to any sample analysis. 3) Spike all parameters as per Attachment II.

The GFAA protocol is specified in Attachment III. The frequency and limits of certain audits are changed from that given in SOW for all analyses as per Attachment III.

9. Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If not completed, format of results will be left to program discretion.

All of the deliverables included in SOW 7/88 or current SOW are required. Also, provide current quarterly XI, XII, XIII for each case. Submit Form VIII separate for each separate parameter analyzed by MSA. Form VIII must be modified to include the slope of each addition as well as the correlation coefficient. Use footnotes on Form I for reporting results, except use IDL of Attachment II for detection limit. Make changes on Forms V, VI, VII to reflect SAS contract limits and IDL where appropriate.

10. All analytical results will be reported down to MDL, and flagged with "J".  
Other (use additional sheets or attach supplementary information, as needed):

- 
11. Name of sampling/shipping contact: Wendy Dewar/Robert Hank

Phone: (312) 786-1313

Please return this request to the Sample Management Office as soon as possible to expedite processing of your request for special analytical services.

## I. DATA REQUIREMENTS

<u>Parameter</u>	<u>Detection Limit</u>	<u>Precision Desired</u> (+% or Conc.)
<u>ICP Metals (Cr)</u>	<u>See Attachment II</u>	<u>10% RPD or Duplicate</u>
<u>Furnace Metals (As, Pb, Cd)</u>	<u>See Attachment II</u>	<u>Differences &lt; SAS IDL of - Attachment II</u>
<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>

## II. QC REQUIREMENTS

<u>Audits Required</u>	<u>Frequency of Audits</u>	<u>Limits* (% or Conc.)</u>
<u>For ICP Chromium</u>	<u>See 9.A of Attachment III</u>	<u></u>
<u>GFAA (undigested) As,Cd,Pb</u>	<u>See 9.B of Attachment III</u>	<u></u>
<u>GFAA (digested) As,Cd,Pb</u>	<u>See 9.C of Attachment III</u>	<u></u>

### III. ACTION REQUIRED IF LIMITS ARE EXCEEDED:

**Take corrective action and repeat analysis**

Contact Jay Thakkar at (312)886-1972

Please return this request to the Sample Management Office as soon as possible to expedite processing of your request for special analytical services. Should you have any questions or need any assistance, please call the Sample Management Office.

**ATTACHMENT I**  
**SCHEDULE**  
**TENTATIVE START DATE: 6/4/90**  
**SAMPLING FOR SOUTHEAST ROCKFORD**  
**OPERABLE UNIT**

<u>WEEK</u>	<u>INVESTIGATIVE SAMPLES</u>	<u>FIELD BLANKS</u>	<u>FIELD DUPLICATE</u>
1	77	8	8
2	78	9	9

NOTE: Samples will be shipped on a daily basis.

## ATTACHMENT II

### Instrument Detection Limit and Spiking Level for Drinking Water

<u>Compound</u>	<u>Required Instrument Detection Limit<sup>1</sup> ug/L</u>			<u>Required Matrix Spike Concentrations ug/L</u>		
	<u>GFAA</u>	<u>ICP</u>	<u>Other</u>	<u>GFAA</u>	<u>ICP</u>	<u>Other</u>
Metal:						
1. Arsenic	5			20		
2. Cadmium <sup>2</sup>	0.5			2	50	
3. Chromium		10			200	
4. Lead <sup>2</sup>	2			20	500	

<sup>1</sup> Instrument Detection Limits (IDL) must be met before any samples are analyzed. The Lab may submit their quarterly Form XI with each case if all IDLs meet the detection limits. If detection limits cannot be met by using ICP, use of GFAA required.

<sup>2</sup> ICP analysis results may only be reported for Cd and Pb, if the concentration is > 10 times the IDL of instrument used. If ICP results are reported, all ICP audits are required including matrix spike.

### ATTACHMENT III

#### Special Instruments for GFAA and QC Requirements for All Analysis

1. Sample aliquots are preserved in the field as follows:
  - a) One liter preserved with 5ml/l of 50%  $\text{HNO}_3$  to  $\text{pH} < 2$  for all metals (excluding Hg).
2. Analysis of the metals (specified in Attachment II) by graphite furnace atomic absorption (GFAA) must use the method of standard additions for quantitation.
3. All of the samples for GFAA metals can be analyzed without digestion if the samples are clean and without any particulates. In this case, a calibration blank, duplicate, ICVS, and CCVS shall be analyzed without digestion. If CCV is out, rerun previous to samples and CCV.
4. If any of the samples contain particulate or significant suspended solids, sample aliquots, preparation blank, duplicate, matrix spikes and lab control samples are to be digested per page D-2 of SOW.
5. No identified field blank may be used as a laboratory duplicate or matrix spike sample.
- 6.1 Zeeman, Smith/Hieftje background correction or equivalent (not  $D_2$ ) is required for Arsenic or any element with structured background interferences.
- 6.2 The matrix modifiers of SOW 785 are mandatory for As.
- 6.3 L'vov platform is allowed.
- 6.4 Any matrix modifiers for Cd, and Pb must be approved by the Region V Central Regional Laboratory prior to use and documented with the raw data.
- 6.5 Each sample or QC audit is to be determined by the MSA using the sample or QC audit and then three consecutive spikes.
- 6.6 Each calibration blank and QC audit solution must contain the same nitric acid concentration as the sample (or diluted samples). All solutions analyzed must have their matrix concentrations fully documented in the raw data.
- 6.7 Each analytical determination must have the resulting absorbance clearly recorded and documented in the order of determined.

ATTACHMENT III (Continued)

- 6.8 The data for each MSA determination must show; slope (signal/conc.), intercept and correlation coefficient ( $r$ ). The results must be reported on Form VIII for all samples and QC audits in order of analysis. Form VIII must be modified to include the above mentioned slope.
- 6.9 Samples and QC audits will be tested in the following order for the method of standard addition quantitation.
- a) calibration blank and + 3 spikes
  - b) ICVS (provided by EMSL-LV) + 3 spikes
  - c) 5 samples, each with 3 spikes
  - d) calibration blank + 3 spikes
  - e) CCVS + 3 spikes
  - f) succeeding sets of 5 samples, calibration blank, and CCVS.
7. Report the correlation coefficient for all MSA analyses.  $r \geq 0.995$  is required for all sample and audit analyses. A correlation coefficient ( $r$ )  $\geq 0.998$  is recommended for the calibration blank or problems will occur with the sample analysis. If  $r < 0.995$  or the slope is  $< 35\%$  of the initial calibration blank, reanalyze the sample once. If the standard addition again fails these criteria, dilute the sample 1:1 or minimum dilution and reanalyze. If the standard addition again fails, flag the data with a "+".
8. Care must be taken to avoid exceeding the linear range for all GFAA analyses. This problem is especially severe with Cd and Pb. Dilution of the samples may be necessary to avoid this problem.
9. If sample concentration is higher than the highest spike added dilute sample 1:1 and reanalyze.
10. For MSA, use 10, 20, and 30 ug/l calibration standards and for Cadmium, use 1, 2 and 3 ug/l calibration standards for 3 spike addition.

**ATTACHMENT III  
QC REQUIREMENTS**

9.A ICP Metals <u>Audits Required</u>	<u>Frequency of Audits</u>	<u>Limits</u>
ICVS, CCVS, ICP serial dilution, ICP ICS	as per SOW 7/88	as per SOW-7/88
Calibration Blank	beginning of run and 1 in 10 thereafter	≤ IDL
Preparation Blank	1 in 10 samples	< SAS IDL of Attachment II
Duplicate	1 in 10 samples	10% RPD or Difference is < SAS IDL, 15% for Hg & CN
CRDL Standard (using SAS DL)	as per SOW 7/88	
Matrix Spike (ICP)	1 in 10 samples	85 - 115% Recovery
Matrix Spike (ICP-Ca, Mg, Na, K)*	1 in 10 samples	85 - 115% Recovery
Matrix Spike (Hg & CN)	1 in 10 samples	80 - 120%
Lab Control Sample (Digested)	1 per sample set	85 - 115%

**\*May be combined with other spike (cf Item 8 of SAS).**

9.B GFAA Undigested Samples <u>Audits Required</u>	<u>Frequency of Audits</u>	<u>Limits</u>
1) Duplicate	1 in 10 samples	Difference of ≤ SAS IDL of Attachment II or ≤ 10% RPD
2) Calibration Blank	Initially and after every 5 samples	≤ IDL
3) ICVS and CCVS	Initially ICVS, and CCVS after every 5 samples	90% - 110%



**ATTACHMENT III**  
**QC REQUIREMENTS (Continued)**

9.C	<u>GFAA Digested Samples Audits Required</u>	<u>Frequency of Audits</u>	<u>Limits</u>
1)	Calibration Blank	Initially and after every 5 samples	< IDL
2)	Preparation Blank (Digested)	1 in 10 samples	< SAS IDL of Attachment II
3)	Duplicates (Digested)	1 in 10 samples	Difference of < SAS IDL or 10% RPD
4)	Matrix Spike	1 in 10 samples	85 - 115% Recovery
5)	Lab Control Sample (Digested)	1 per set of samples	85 - 115% Recovery
6)	ICVS, CCVS	Initially ICVS, and CCVS after every 5 samples	90 - 110% Recovery

U.S. Environmental Protection Agency  
CLP Sample Management Office  
P.O. Box 818, Alexandria, Virginia 22313  
PHONE: (703)/557-2490 or FTS/557-2490

SAS Number

SPECIAL ANALYTICAL SERVICES  
Client Request

☒

Regional Transmittal

☐

Telephone Request

- A. EPA Region/Client: Region V
- B. RSCC Representative: Jan Pels
- C. Telephone Number: (312) 353-2720
- D. Date of Request: May 1990
- E. Site Name: Southeast Rockford

Please provide below a description of your request for Special Analytical Services under the Contract Laboratory Program. In order to most efficiently obtain laboratory capability for your request, please address the following considerations, if applicable. Incomplete or erroneous information may result in delay in the processing of your request. Please continue response on additional sheets, or attach supplementary information as needed.

1. General description of analytical service requested: Analysis of Drinking Water for VOCs by EPA Method 524.2, Revision 3 for the 9 compounds listed in Attachment I. Samples that have an estimated total VOC concentration over 50 ug/l will be identified and labeled on the Traffic Report and sample tags and at the laboratories' option, may be screened using the CLP VOA optional screening method of hexadecane extract for volatiles of SOW 7/88. Estimates of VOC concentration range from 0-200 ug/l. If the concentration exceeds 50 ug/l run at 1 x and if necessary dilute so that the compound with the highest concentration falls within the calibration range. Report all reanalysis results at each dilution denoting dilution factors and the compounds that exceeded the calibration range. Results at each dilution, including non-diluted results, shall be submitted with the data package.
2. Definition and number of work units involved (specify whether whole samples or fractions; whether organics or inorganics; whether aqueous or soil and sediments; and whether low, medium, or high concentration):  
  
144 Residential, 10 Industrial and 1 Public Well water investigative samples, 17 field blanks, 17 field duplicates and 1 trip blank per cooler totaling 15. Samples will be collected over a 2 week period. Samples are water samples with total VOC concentration estimated to be in the 0-200 ug/l range.
3. Purpose of analysis (specify whether Superfund (Remedial or Enforcement), RCRA, NPDES, etc.):

Superfund Remedial State Lead

4. Estimated date(s) of collections: June 4 to June 16, 1990 (Attachment II)
5. Estimated date(s) and method of shipment: June 4 to June 16, 1990 - Overnight Express Service.
6. Number of days analysis and data required after laboratory receipt of samples:

Analysis within 5 days of sample receipt. Full data package due within 21 days.

7. Analytical protocol required (attach copy if other than a protocol currently used in this program):

Method 524.2, Revision 3 (Attachment III). The accuracy and precision range required for sample analysis is 0.5 to 50 ug/l. A study of the accuracy and precision over the range of 0.5 to 50 ug/l shall be completed by the lab and the results must be submitted with the data. The accuracy and precision of the lab control standard, which can be one of the standards used for calibration, shall be  $\pm 20$  percent. Wide-bore, thick-film columns will be used for analysis. Five calibration standards composed of 8 of the 9 compounds listed in Attachment I (cis-1,2-dichloroethylene will be used for calibration but not trans-1,2-dichloroethylene) will be used to obtain calibration over a 0.5 to 50 ug/l range. The GC/MS will be calibrated for only the 9 compounds of concern (Attachment I). For each calibration standard the relative retention times of each compound in each calibration run should agree within 0.06 relative retention time units. The lab can choose the appropriate calibration standard concentrations in order to obtain calibration over the 0.5 to 50 ug/l range. The optional vinyl chloride calibration procedure from Section 9.4 of Method 524.2, Revision 3 will be used. The %RSD for each individual calibration compound must be less than or equal to 30.0 percent.

The continuing calibration check standard shall contain all nine (9) target compounds. If percent difference of any compound of the continuing calibration check standard is greater than 25%, then corrective action shall be taken. The minimum relative response factor (RF) for each target compound shall be greater than 0.150.

8. Special technical instruction (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.): Complete resolution of cis-1,2-dichloroethylene and trans-1,2-dichloroethylene is required with cis-1,2-dichloroethylene used for calibration. Surrogates and matrix spikes appropriate for each method must be performed. Perform surrogate spike analysis described in Method 524.2, Revision 3, Section 10.3.3 and 7.5.1 with BFB as the surrogate at a concentration of 5 ug/l. The internal standard shall consist of fluorobenzene at a concentration of 5 ug/l. The matrix spike (MS) standard shall consist of all 9 target compounds. The MS Standard specified in CLP SOW shall NOT be used. One quality control standard from an external source must be analyzed per laboratory. The external quality control standard will at minimum contain the 9 contaminants of concern. The results must be submitted with the data. Standard and surrogate compounds must be supplied by the laboratory.

US4044

9. Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of Custody documentation, etc.). If not completed, format of results will be left to program discretion.

Complete EPA CLP type data package including but not limited: narrative, QC Summary, chromatograms, integration reports, all standard and spiking concentrations, injection volumes, dilution factors, analytical sequence summary, calculation, dates and times. Only the 9 target compounds, if detected, shall be reported, all other volatile organics shall NOT be reported. All analytical results will be reported down to MDL, and flagged with "J".

10. Other (use additional sheets or attach supplementary information, as needed): .

After samples that contain a total VOC concentration of greater than 50 ug/l are analyzed a lab reagent blank must be analyzed to check for cross contamination. Samples that require ascorbic acid addition for dechlorination will be labeled. All other samples require no preservation except for cooling to 4°C.

11. Name of sampling/shipping contact: Robert Hank/Wendy Dewar

Phone: (312) 786-1313

Please return this request to the Sample Management Office as soon as possible to expedite processing of your request for special analytical services.

## I. DATA REQUIREMENTS

<u>Parameter</u>	<u>Detection Limit</u>	<u>Precision Desired</u> (+% or Conc.)
See Attachment I		

## II. OC AUDIT REQUIREMENTS

<u>Audits Required</u>	<u>Frequency of Audits</u>	<u>Limits* (% or Conc.)</u>
<u>Surrogate Spiking</u>	<u>All Samples, Stds. Blanks</u>	<u>± 15%</u>
<u>Duplicate Analysis</u>	<u>1 per 10</u>	<u>20% RPD for compounds present at more than 10x MDL</u>
<u>Lab Reagent Blank</u>	<u>1 per 10*</u>	<u>Less than Method Detection Limit</u>
<u>Matrix Spike/Matrix Spike Duplicate**</u>	<u>1 per 25 or per lab</u>	<u>80-120% recovery, 20% RPD</u>
<u>QC Check Sample***</u>	<u>Once each time 5 pt. calibration curve is generated.</u>	<u>±20% @ 5 ug/l for 7 out of 8 compounds. TCE must be in control.</u>

**\*A field blank may not be substituted.**

**\*\*Matrix Spike/Matrix Spike Duplicate** must be composed of the compounds being analyzed.

\*\*\*All target compounds except vinyl chloride must be in this sample.

III. ACTION REQUIRED IF LIMITS ARE EXCEEDED:

If surrogate spike recovery is greater than  $\pm 15\%$ , reanalyze once. If recovery is again greater than  $\pm 15\%$  report data as estimated. If duplicate is greater than 20 RPD for required compounds, repeat once and report results. If matrix spike does not meet limits do not repeat, report results, flag data.

Please return this request to the Sample Management Office as soon as possible to expedite processing of your request for special analytical services. Should you have any questions or need any assistance, please call the Sample Management Office.

**ATTACHMENT I**

<u>COMPOUND</u>	<u>METHOD DETECTION LIMIT (ug/l)</u>
Trichloroethylene	0.50
1,1,1 Trichloroethane	0.50
1,1-Dichloroethylene	0.50
Tetrachloroethylene	0.50
1,2-Dichloroethane	0.50
1,1-Dichloroethane	0.50
Vinyl Chloride	0.50
Cis-1,2-Dichloroethylene	0.50
Trans-1,2-Dichloroethylene	0.50

**ATTACHMENT II**  
**SCHEDULE**  
**TENTATIVE START DATE: 6/4/90**  
**SAMPLING FOR SOUTHEAST ROCKFORD**  
**OPERABLE UNIT**

<u>WEEK</u>	<u>INVESTIGATIVE SAMPLES</u>	<u>FIELD BLANKS</u>	<u>FIELD DUPLICATE</u>	<u>TRIP BLANK</u>
1	77	8	8	7
2	78	9	9	8

NOTE: Samples will be shipped on a daily basis.

**ATTACHMENT III**  
**METHOD 524.2**



**METHOD 524.2. MEASUREMENT OF PURGEABLE ORGANIC COMPOUNDS IN  
WATER BY CAPILLARY COLUMN GAS CHROMATOGRAPHY/MASS SPECTROMETRY**

**Revision 3.0**

**A. Alford-Stevens, J. W. Eichelberger, W. L. Budde - Method 524, Revision 1.0  
(1983)**

**R. W. Slater, Jr. - Method 524.2, Revision 2.0 (1986)**

**J. W. Eichelberger, W. L. Budde - Method 524.2, Revision 3.0 (1989)**

**ENVIRONMENTAL MONITORING SYSTEMS LABORATORY  
OFFICE OF RESEARCH AND DEVELOPMENT  
U.S. ENVIRONMENTAL PROTECTION AGENCY  
CINCINNATI, OHIO 45268**

## METHOD 524.2

### MEASUREMENT OF PURGEABLE ORGANIC COMPOUNDS IN WATER BY CAPILLARY COLUMN GAS CHROMATOGRAPHY/MASS SPECTROMETRY

#### 1. SCOPE AND APPLICATION

- 1.1 This is a general purpose method for the identification and simultaneous measurement of purgeable volatile organic compounds in finished drinking water, raw source water, or drinking water in any treatment stage (1-2). The method is applicable to a wide range of organic compounds, including the four trihalomethane disinfection by-products, that have sufficiently high volatility and low water solubility to be efficiently removed from water samples with purge and trap procedures. The following compounds can be determined by this method.

<u>Compound</u>	<u>Chemical Abstract Service Registry Number</u>
Benzene	71-43-2
Bromobenzene	108-86-1
Bromochloromethane	74-97-5
Bromodichloromethane	75-27-4
Bromoform	75-25-2
Bromomethane	74-83-9
n-Butylbenzene	104-51-8
sec-Butylbenzene	135-98-8
tert-Butylbenzene	98-06-6
Carbon tetrachloride	56-23-5
Chlorobenzene	108-90-7
Chloroethane	75-00-3
Chloroform	67-66-3
Chloromethane	74-87-3
2-Chlorotoluene	95-49-8
4-Chlorotoluene	106-43-4
Dibromochloromethane	124-48-1
1,2-Dibromo-3-chloropropane	96-12-8
1,2-Dibromoethane	106-93-4
Dibromomethane	74-95-3
1,2-Dichlorobenzene	95-50-1
1,3-Dichlorobenzene	541-73-1
1,4-Dichlorobenzene	106-46-7
Dichlorodifluoromethane	75-71-8
1,1-Dichloroethane	75-34-3
1,2-Dichloroethane	107-06-2
1,1-Dichloroethene	75-35-4
cis-1,2-Dichloroethene	156-59-4
trans-1,2-Dichloroethene	156-60-5
1,2-Dichloropropane	78-87-5
1,3-Dichloropropane	142-28-9

2,2-Dichloropropane	590-20-7
1,1-Dichloropropene	563-58-6
cis-1,3-Dichloropropene	10061-01-5
trans-1,3-Dichloropropene	10061-02-6
Ethylbenzene	100-41-4
Hexachlorobutadiene	87-68-3
Isopropylbenzene	98-82-8
4-Isopropyltoluene	99-87-6
Methylene chloride	75-09-2
Naphthalene	91-20-3
n-Propylbenzene	103-65-1
Styrene	100-42-5
1,1,1,2-Tetrachloroethane	630-20-6
1,1,2,2-Tetrachloroethane	79-34-5
Tetrachloroethene	127-18-4
Toluene	108-88-3
1,2,3-Trichlorobenzene	87-61-6
1,2,4-Trichlorobenzene	120-82-1
1,1,1-Trichloroethane	71-55-6
1,1,2-Trichloroethane	79-00-5
Trichloroethene	79-01-6
Trichlorofluoromethane	75-69-4
1,2,3-Trichloropropane	96-18-4
1,2,4-Trimethylbenzene	95-63-6
1,3,5-Trimethylbenzene	108-67-8
Vinyl chloride	75-01-4
o-Xylene	95-47-6
m-Xylene	108-38-3
p-Xylene	106-42-3

1.2 Method detection limits (MDLs) (3) are compound and instrument dependent and vary from approximately 0.02-0.35  $\mu\text{g/L}$ . The applicable concentration range of this method is primarily column dependent and is approximately 0.02 to 200  $\mu\text{g/L}$  for the wide-bore thick-film columns. Narrow-bore thin-film columns may have a capacity which limits the range to about 0.02 to 20  $\mu\text{g/L}$ . Analytes that are inefficiently purged from water will not be detected when present at low concentrations, but they can be measured with acceptable accuracy and precision when present in sufficient amounts.

1.3 Analytes that are not separated chromatographically, but which have different mass spectra and non-interfering quantitation ions, can be identified and measured in the same calibration mixture or water sample (Sect 11.6.2). Analytes which have very similar mass spectra cannot be individually identified and measured in the same calibration mixture or water sample unless they have different retention times (Sect.11.6.3). Coeluting compounds with very similar mass spectra, typically many structural isomers, must be reported as an isomeric group or pair. Two of the three isomeric xylenes and two of the three dichlorobenzenes are examples of structural isomers that may not be resolved on the capillary column, and if not, must be reported as isomeric pairs.

## 2. SUMMARY OF METHOD

2.1 Volatile organic compounds and surrogates with low water solubility are extracted (purged) from the sample matrix by bubbling an inert gas through the aqueous sample. Purged sample components are trapped in a tube containing suitable sorbent materials. When purging is complete, the sorbent tube is heated and backflushed with helium to desorb the trapped sample components into a capillary gas chromatography (GC) column interfaced to a mass spectrometer (MS). The column is temperature programmed to separate the method analytes which are then detected with the MS. Compounds eluting from the GC column are identified by comparing their measured mass spectra and retention times to reference spectra and retention times in a data base. Reference spectra and retention times for analytes are obtained by the measurement of calibration standards under the same conditions used for samples. The concentration of each identified component is measured by relating the MS response of the quantitation ion produced by that compound to the MS response of the quantitation ion produced by a compound that is used as an internal standard. Surrogate analytes, whose concentrations are known in every sample, are measured with the same internal standard calibration procedure.

## 3. DEFINITIONS

- 3.1 Internal standard -- A pure analyte(s) added to a solution in known amount(s) and used to measure the relative responses of other method analytes and surrogates that are components of the same solution. The internal standard must be an analyte that is not a sample component.
- 3.2 Surrogate analyte -- A pure analyte(s), which is extremely unlikely to be found in any sample, and which is added to a sample aliquot in known amount(s) before extraction and is measured with the same procedures used to measure other sample components. The purpose of a surrogate analyte is to monitor method performance with each sample.
- 3.3 Laboratory duplicates (LD1 and LD2) -- Two sample aliquots taken in the analytical laboratory and analyzed separately with identical procedures. Analyses of LD1 and LD2 give a measure of the precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.
- 3.4 Field duplicates (FD1 and FD2) -- Two separate samples collected at the same time and place under identical circumstances and treated exactly the same throughout field and laboratory procedures. Analyses of FD1 and FD2 give a measure of the precision associated with sample collection, preservation and storage, as well as with laboratory procedures.
- 3.5 Laboratory reagent blank (LRB) -- An aliquot of reagent water that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with other samples. The LRB is used to determine if method

analytes or other interferences are present in the laboratory environment, the reagents, or the apparatus.

- 3.6 Field reagent blank (FRB) -- Reagent water placed in a sample container in the laboratory and treated as a sample in all respects, including exposure to sampling site conditions, storage, preservation and all analytical procedures. The purpose of the FRB is to determine if method analytes or other interferences are present in the field environment.
- 3.7 Laboratory performance check solution (LPC) -- A solution of one or more compounds (analytes, surrogates, internal standard, or other test compounds) used to evaluate the performance of the instrument system with respect to a defined set of method criteria.
- 3.8 Laboratory fortified blank (LFB) -- An aliquot of reagent water to which known quantities of the method analytes are added in the laboratory. The LFB is analyzed exactly like a sample, and its purpose is to determine whether the methodology is in control, and whether the laboratory is capable of making accurate and precise measurements at the required method detection limit.
- 3.9 Laboratory fortified sample matrix (LFM) -- An aliquot of an environmental sample to which known quantities of the method analytes are added in the laboratory. The LFM is analyzed exactly like a sample, and its purpose is to determine whether the sample matrix contributes bias to the analytical results. The background concentrations of the analytes in the sample matrix must be determined in a separate aliquot and the measured values in the LFM corrected for background concentrations.
- 3.10 Stock standard solution -- A concentrated solution containing a single certified standard that is a method analyte, or a concentrated solution of a single analyte prepared in the laboratory with an assayed reference compound. Stock standard solutions are used to prepare primary dilution standards.
- 3.11 Primary dilution standard solution -- A solution of several analytes prepared in the laboratory from stock standard solutions and diluted as needed to prepare calibration solutions and other needed analyte solutions.
- 3.12 Calibration standard (CAL) -- a solution prepared from the primary dilution standard solution and stock standard solutions of the internal standards and surrogate analytes. The CAL solutions are used to calibrate the instrument response with respect to analyte concentration.
- 3.13 Quality control sample (QCS) -- a sample matrix containing method analytes or a solution of method analytes in a water miscible solvent which is used to fortify reagent water or environmental samples. The QCS is obtained from a source external to the laboratory, and is used

to check laboratory performance with externally prepared test materials.

#### 4. INTERFERENCES

- 4.1 During analysis, major contaminant sources are volatile materials in the laboratory and impurities in the inert purging gas and in the sorbent trap. The use of non-polytetrafluoroethylene (PTFE) plastic tubing, non-PTFE thread sealants, or flow controllers with rubber components in the purging device should be avoided since such materials out-gas organic compounds which will be concentrated in the trap during the purge operation. Analyses of laboratory reagent blanks provide information about the presence of contaminants. When potential interfering peaks are noted in laboratory reagent blanks, the analyst should change the purge gas source and regenerate the molecular sieve purge gas filter. Subtracting blank values from sample results is not permitted.
- 4.2 Interfering contamination may occur when a sample containing low concentrations of volatile organic compounds is analyzed immediately after a sample containing relatively high concentrations of volatile organic compounds. A preventive technique is between-sample rinsing of the purging apparatus and sample syringes with two portions of reagent water. After analysis of a sample containing high concentrations of volatile organic compounds, one or more laboratory reagent blanks should be analyzed to check for cross contamination.
- 4.3 Special precautions must be taken to determine methylene chloride. The analytical and sample storage area should be isolated from all atmospheric sources of methylene chloride, otherwise random background levels will result. Since methylene chloride will permeate through PTFE tubing, all gas chromatography carrier gas lines and purge gas plumbing should be constructed of stainless steel or copper tubing. Laboratory worker's clothing should be cleaned frequently since clothing previously exposed to methylene chloride fumes during common liquid/liquid extraction procedures can contribute to sample contamination.

#### 5. SAFETY

- 5.1 The toxicity or carcinogenicity of chemicals used in this method has not been precisely defined; each chemical should be treated as a potential health hazard, and exposure to these chemicals should be minimized. Each laboratory is responsible for maintaining awareness of OSHA regulations regarding safe handling of chemicals used in this method. Additional references to laboratory safety are available (4-6) for the information of the analyst.
- 5.2 The following method analytes have been tentatively classified as known or suspected human or mammalian carcinogens: benzene, carbon tetrachloride, 1,4-dichlorobenzene, 1,2-dichloroethane, hexachlorobutadiene 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, chloro-

form, 1,2-dibromoethane, tetrachloroethene, trichloroethene, and vinyl chloride. Pure standard materials and stock standard solutions of these compounds should be handled in a hood. A NIOSH/MESA approved toxic gas respirator should be worn when the analyst handles high concentrations of these toxic compounds.

## 6. APPARATUS AND EQUIPMENT

- 6.1 **SAMPLE CONTAINERS** -- 60-mL to 120-mL screw cap vials (Pierce #19832 or equivalent) each equipped with a PTFE-faced silicone septum (Pierce #12718 or equivalent). Prior to use, wash vials and septa with detergent and rinse with tap and distilled water. Allow the vials and septa to air dry at room temperature, place in a 105°C oven for 1 hr, then remove and allow to cool in an area known to be free of organics.
- 6.2 **PURGE AND TRAP SYSTEM** -- The purge and trap system consists of three separate pieces of equipment: purging device, trap, and desorber. Systems are commercially available from several sources that meet all of the following specifications.
- 6.2.1 The all glass purging device (Figure 1) should be designed to accept 25-mL samples with a water column at least 5 cm deep. A smaller (5-mL) purging device is recommended if the GC/MS system has adequate sensitivity to obtain the method detection limits required. Gaseous volumes above the sample must be kept to a minimum (< 15 mL) to eliminate dead volume effects. A glass frit should be installed at the base of the sample chamber so the purge gas passes through the water column as finely divided bubbles with a diameter of < 3 mm at the origin. Needle spargers may be used, however, the purge gas must be introduced at a point about 5 mm from the base of the water column.
- 6.2.2 The trap (Figure 2) must be at least 25 cm long and have an inside diameter of at least 0.105 in. Starting from the inlet, the trap should contain 1.0 cm of methyl silicone coated packing and the following amounts of adsorbents: 1/3 of 2,6-diphenylene oxide polymer, 1/3 of silica gel, and 1/3 of coconut charcoal. If it is not necessary to determine dichlorodifluoromethane, the charcoal can be eliminated and the polymer increased to fill 2/3 of the trap. Before initial use, the trap should be conditioned overnight at 180°C by backflushing with an inert gas flow of at least 20 mL/min. Vent the trap effluent to the room, not to the analytical column. Prior to daily use, the trap should be conditioned for 10 min at 180°C with backflushing. The trap may be vented to the analytical column during daily conditioning; however, the column must be run through the temperature program prior to analysis of samples.
- 6.2.3 The use of the methyl silicone coated packing is recommended, but not mandatory. The packing serves a dual purpose of protecting the Tenax adsorbant from aerosols, and also of

insuring that the Tenax is fully enclosed within the heated zone of the trap thus eliminating potential cold spots. Alternatively, silanized glass wool may be used as a spacer at the trap inlet.

- 6.2.4 The desorber (Figure 2) must be capable of rapidly heating the trap to 180°C either prior to or at the beginning of the flow of desorption gas. The polymer section of the trap should not be heated higher than 200°C or the life expectancy of the trap will decrease. Trap failure is characterized by a pressure drop in excess of 3 pounds per square inch across the trap during purging or by poor bromoform sensitivities. The desorber design illustrated in Fig. 2 meets these criteria.

### 6.3 GAS CHROMATOGRAPHY/MASS SPECTROMETER/DATA SYSTEM (GC/MS/DS)

- 6.3.1 The GC must be capable of temperature programming and should be equipped with variable-constant differential flow controllers so that the column flow rate will remain constant throughout desorption and temperature program operation. The column oven must be cooled to 10°C; therefore, a subambient oven controller is required. If syringe injections of BFB will be used, a split/splitless injection port is required.

- 6.3.2 Capillary Gas Chromatography Columns. Any gas chromatography column that meets the performance specifications of this method may be used. Separations of the calibration mixture must be equivalent or better than those described in this method. Three useful columns have been identified.

6.3.2.1 Column 1 -- 60 m x 0.75 mm ID VOCOL (Supelco, Inc.) glass wide-bore capillary with a 1.5  $\mu$ m film thickness.

Column 2 -- 30 m x 0.53 mm ID DB-624 (J&W Scientific, Inc.) fused silica capillary with a 3  $\mu$ m film thickness.

Column 3 -- 30 m x 0.32 mm ID DB-5 (J&W Scientific, Inc.) fused silica capillary with a 1  $\mu$ m film thickness.

- 6.3.3 Interfaces between the GC and MS. The interface used depends on the column selected and the gas flow rate.

- 6.3.3.1 The wide-bore columns 1 and 2 have the capacity to accept the standard gas flows from the trap during thermal desorption, and chromatography can begin with the onset of thermal desorption. Depending on the pumping capacity of the MS, an additional interface between the end of the column and the MS may be required. An open split interface (7), an all-glass jet separator, or a cryogenic (Sect. 6.3.3.2) device



are acceptable interfaces. Any interface can be used if the performance specifications described in this method can be achieved. The end of the transfer line after the interface, or the end of the analytical column if no interface is used, should be placed within a few mm of the MS ion source.

- 6.3.3.2 The narrow bore column 3 cannot accept the thermal desorption gas flow, and a cryogenic interface is required. This interface (Tekmar Model 1000 or equivalent) condenses the desorbed sample components at liquid nitrogen temperature, and allows the helium gas to pass through to an exit. The condensed components are frozen in a narrow band on an uncoated fused silica precolumn. When all components have been desorbed from the trap, the interface is rapidly heated under a stream of carrier gas to transfer the analytes to the analytical column. The end of the analytical column should be placed with a few mm of the MS ion source. A potential problem with this interface is blockage of the interface by frozen water from the trap. This condition will result in a major loss in sensitivity and chromatographic resolution.
- 6.3.4 The mass spectrometer must be capable of electron ionization at a nominal electron energy of 70 eV.<sup>2</sup> The spectrometer must be capable of scanning from 35 to 260 amu with a complete scan cycle time (including scan overhead) of 2 sec or less. (Scan cycle time = Total MS data acquisition time in seconds divided by number of scans in the chromatogram). The spectrometer must produce a mass spectrum that meets all criteria in Table 3 when 25 ng or less of 4-bromofluorobenzene (BFB) is introduced into the GC. An average spectrum across the BFB GC peak may be used to test instrument performance.
- 6.3.5 An interfaced data system is required to acquire, store, reduce, and output mass spectral data. The computer software should have the capability of processing stored GC/MS data by recognizing a GC peak within any given retention time window, comparing the mass spectra from the GC peak with spectral data in a user-created data base, and generating a list of tentatively identified compounds with their retention times and scan numbers. The software must allow integration of the ion abundance of any specific ion between specified time or scan number limits. The software should also allow calculation of response factors as defined in Sect. 9.2.6 (or construction of a second or third order regression calibration curve), calculation of response factor statistics (mean and standard deviation), and calculation of concentrations of analytes using either the calibration curve or the equation in Sect. 12.

#### 6.4 SYRINGE AND SYRINGE VALVES

- 6.4.1 Two .5-ml or 25-ml glass hypodermic syringes with Luer-Lok tip (depending on sample volume used).
- 6.4.2 Three 2-way syringe valves with Luer ends.
- 6.4.3 One 25- $\mu$ L micro syringe with a 2 in x 0.006 in ID, 22° bevel needle (Hamilton #702N or equivalent).
- 6.4.4 Micro syringes - 10, 100  $\mu$ L.
- 6.4.5 Syringes - 0.5, 1.0, and 5-ml, gas tight with shut-off valve.

#### 6.5 MISCELLANEOUS

- 6.5.1 Standard solution storage containers -- 15-ml bottles with PTFE-lined screw caps.

### 7. REAGENTS AND CONSUMABLE MATERIALS

#### 7.1 TRAP PACKING MATERIALS

- 7.1.1 2,6-Diphenylene oxide polymer, 60/80 mesh, chromatographic grade (Tenax GC or equivalent).
- 7.1.2 Methyl silicone packing (optional) -- OV-1 (3%) on Chromosorb W, 60/80 mesh, or equivalent.
- 7.1.3 Silica gel -- 35/60 mesh, Davison, grade 15 or equivalent.
- 7.1.4 Coconut charcoal -- Prepare from Barnebey Cheney, CA-580-26 lot #M-2649 by crushing through 26 mesh screen.

#### 7.2 REAGENTS

- 7.2.1 Methanol -- Demonstrated to be free of analytes.
- 7.2.2 Reagent water -- Prepare reagent water by passing tap water through a filter bed containing about 0.5 kg of activated carbon, by using a water purification system, or by boiling distilled water for 15 min followed by a 1-h purge with inert gas while the water temperature is held at 90°C. Store in clean, narrow-mouth bottles with PTFE-lined septa and screw caps.
- 7.2.3 Hydrochloric acid (1+1) -- Carefully add measured volume of conc. HCl to equal volume of reagent water.
- 7.2.4 Vinyl chloride -- Certified mixtures of vinyl chloride in nitrogen and pure vinyl chloride are available from several

sources (for example, Matheson, Ideal Gas Products, and Scott Gases).

7.2.5 Ascorbic acid -- ACS reagent grade, granular.

7.3 STOCK STANDARD SOLUTIONS -- These solutions may be purchased as certified solutions or prepared from pure standard materials using the following procedures. One of these solutions is required for every analyte of concern, every surrogate, and the internal standard. A useful working concentration is about 1-5 mg/mL.

7.3.1 Place about 9.8 mL of methanol into a 10-mL ground-glass stoppered volumetric flask. Allow the flask to stand, unstoppered, for about 10 min or until all alcohol-wetted surfaces have dried and weigh to the nearest 0.1 mg.

7.3.2 If the analyte is a liquid at room temperature, use a 100- $\mu$ L syringe and immediately add two or more drops of reference standard to the flask. Be sure that the reference standard falls directly into the alcohol without contacting the neck of the flask. If the analyte is a gas at room temperature, fill a 5-mL valved gas-tight syringe with the standard to the 5.0-mL mark, lower the needle to 5 mm above the methanol meniscus, and slowly inject the standard into the neck area of the flask. The gas will rapidly dissolve in the methanol.

7.3.3 Reweigh, dilute to volume, stopper, then mix by inverting the flask several times. Calculate the concentration in  $\mu$ g/ $\mu$ L from the net gain in weight. When compound purity is certified at 96% or greater, the weight can be used without correction to calculate the concentration of the stock standard.

7.3.4 Store stock standard solutions in 15-mL bottles equipped with PTFE-lined screw caps. Methanol solutions prepared from liquid analytes are stable for at least 4 weeks when stored at 4°C. Methanol solutions prepared from gaseous analytes are not stable for more than 1 week when stored at <0°C; at room temperature, they must be discarded after 1 day.

7.4 PRIMARY DILUTION STANDARDS -- Use stock standard solutions to prepare primary dilution standard solutions that contain all the analytes of concern and the surrogates (but not the internal standard!) in methanol. The primary dilution standards should be prepared at concentrations that can be easily diluted to prepare aqueous calibration solutions that will bracket the working concentration range. Store the primary dilution standard solutions with minimal headspace and check frequently for signs of deterioration or evaporation, especially just before preparing calibration solutions. Storage times described for stock standard solutions in Sect. 7.4.4 also apply to primary dilution standard solutions.

## 7.5 FORTIFICATION SOLUTIONS FOR INTERNAL STANDARD AND SURROGATES

7.5.1 A solution containing the internal standard and the surrogates is required to prepare laboratory reagent blanks (also used as a laboratory performance check solution), and to fortify each sample. Prepare a fortification solution containing fluoro-benzene (internal standard), 1,2-dichlorobenzene- $d_4$  (surrogate), and BFB (surrogate) in methanol at concentrations of 5  $\mu\text{g/mL}$  of each. A 5- $\mu\text{L}$  aliquot of this solution added to a 25-mL water sample volume gives concentrations of 1  $\mu\text{g/L}$  of each. A 5- $\mu\text{L}$  aliquot of this solution added to a 5-mL water sample volume gives a concentration of 5  $\mu\text{g/L}$  of each. Additional internal standards and surrogate analytes are optional.

7.5.2 A solution of the internal standard alone is required to prepare calibration standards and laboratory fortified blanks. The internal standard should be in methanol at a concentration of 5  $\mu\text{g/mL}$ .

7.6 PREPARATION OF LABORATORY REAGENT BLANK -- Fill a 25-mL (or 5-mL) syringe with reagent water and adjust to the mark (no air bubbles). Inject 10  $\mu\text{L}$  of the fortification solution containing the internal standard and surrogates through the Luer Lok valve into the reagent water. Transfer the LRB to the purging device. See Sect. 11.1.2.

7.7 PREPARATION OF LABORATORY FORTIFIED BLANK -- Prepare this exactly like a calibration standard (Sect. 7.8). This is a calibration standard that is treated as a sample.

## 7.8 PREPARATION OF CALIBRATION STANDARDS

7.8.1 The number of calibration solutions (CALs) needed depends on the calibration range desired. A minimum of three CAL solutions is required to calibrate a range of a factor of 20 in concentration. For a factor of 50, use at least four standards, and for a factor of 100 at least five standards. One calibration standard should contain each analyte of concern and each surrogate at a concentration of 2-10 times the method detection limit (Tables 4-6) for that compound. The other CAL standards should contain each analyte of concern and each surrogate at concentrations that define the range of the method. Every CAL solution contains the internal standard at the same concentration (5  $\mu\text{g/L}$  suggested for a 5-mL sample; 1  $\mu\text{g/L}$  for a 25-mL sample).

7.8.2 To prepare a calibration standard, add an appropriate volume of a primary dilution standard (containing analytes and surrogates) to an aliquot of reagent water in a volumetric flask. Use a microsyringe and rapidly inject the methanol solutions into the expanded area of the filled volumetric flask. Remove the needle as quickly as possible after injection. Mix by inverting the

flask three times only. Discard the contents contained in the neck of the flask. Aqueous standards are not stable in a volumetric flask and should be discarded after 1 hr unless transferred to a sample bottle and sealed immediately.

## **8. SAMPLE COLLECTION, PRESERVATION, AND STORAGE**

### **8.1 SAMPLE COLLECTION, DECHLORINATION, AND PRESERVATION**

- 8.1.1 Collect all samples in duplicate. If samples contain residual chlorine, and measurements of the concentrations of disinfection by-products (trihalomethanes, etc.) at the time of sample collection are desired, add about 25 mg of ascorbic acid to the sample bottle before filling. Fill sample bottles to overflowing, but take care not to flush out the rapidly dissolving ascorbic acid. No air bubbles should pass through the sample as the bottle is filled, or be trapped in the sample when the bottle is sealed. Adjust the pH of the duplicate samples to <2 by carefully adding one drop of 1:1 HCl for each 20 mL of sample volume. Seal the sample bottles, PTFE-face down, and shake vigorously for 1 min.
- 8.1.2 When sampling from a water tap, open the tap and allow the system to flush until the water temperature has stabilized (usually about 10 min). Adjust the flow to about 500 mL/min and collect duplicate samples from the flowing stream.
- 8.1.3 When sampling from an open body of water, fill a 1-quart wide-mouth bottle or 1-liter beaker with sample from a representative area, and carefully fill duplicate sample bottles from the 1-quart container.
- 8.1.4 The samples must be chilled to 4°C on the day of collection and maintained at that temperature until analysis. Field samples that will not be received at the laboratory on the day of collection must be packaged for shipment with sufficient ice to ensure that they will be at 4°C on arrival at the laboratory.

### **8.2 SAMPLE STORAGE**

- 8.2.1 Store samples at 4°C until analysis. The sample storage area must be free of organic solvent vapors.
- 8.2.2 Analyze all samples within 14 days of collection. Samples not analyzed within this period must be discarded and replaced.

### **8.3 FIELD REAGENT BLANKS**

- 8.3.1 Duplicate field reagent blanks must be handled along with each sample set, which is composed of the samples collected from the same general sample site at approximately the same time. At the laboratory, fill field blank sample bottles with reagent

water, seal, and ship to the sampling site along with empty sample bottles and back to the laboratory with filled sample bottles. Wherever a set of samples is shipped and stored, it is accompanied by appropriate blanks.

- 8.3.2 Use the same procedures used for samples to add ascorbic acid and HCl to blanks (Sect. 8.1.1).

## 9. CALIBRATION

9.1 Demonstration and documentation of acceptable initial calibration is required before any samples are analyzed and is required intermittently throughout sample analysis as dictated by results of continuing calibration checks. After initial calibration is successful, a continuing calibration check is required at the beginning of each 8 hr. period during which analyses are performed. Additional periodic calibration checks are good laboratory practice.

### 9.2 Initial calibration

- 9.2.1 Calibrate the mass and abundance scales of the MS with calibration compounds and procedures prescribed by the manufacturer with any modifications necessary to meet the requirements in Sect. 9.2.2.
- 9.2.2 Introduce into the GC (either by purging a laboratory reagent blank or making a syringe injection) 25 ng of BFB and acquire mass spectra for  $m/z$  35-260 at 70 eV (nominal). Use the purging procedure and/or GC conditions given in Sect. 11. If the spectrum does not meet all criteria in Table 2, the MS must be retuned and adjusted to meet all criteria before proceeding with calibration. An average spectrum across the GC peak may be used to evaluate the performance of the system.
- 9.2.3 Purge a medium CAL solution, for example 10-20  $\mu\text{g/L}$ , using the procedure given in Sect. 11.
- 9.2.4 Performance criteria for the medium calibration. Examine the stored GC/MS data with the data system software. Figure 3 shows an acceptable total ion chromatogram.
- 9.2.4.1 GC performance. Good column performance will produce symmetrical peaks with minimum tailing for most compounds. If peaks are broad, or sensitivity poor, see Sect. 9.3.6 for some possible remedial actions.
- 9.2.4.2 MS sensitivity. The GC/MS/DS peak identification software should be able to recognize a GC peak in the appropriate retention time window for each of the compounds in calibration solution, and make correct tentative identifications. If fewer than 99% of the

compounds are recognized, system maintenance is required. See Sect. 9.3.6.

- 9.2.5 If all performance criteria are met, purge an aliquot of each of the other CAL solutions using the same GC/MS conditions.
- 9.2.6 Calculate a response factor (RF) for each analyte, surrogate, and isomer pair for each CAL solution using the internal standard fluorobenzene. Table 1 contains suggested quantitation ions for all compounds. This calculation is supported in acceptable GC/MS data system software (Sect. 6.3.4), and many other software programs. RF is a unitless number, but units used to express quantities of analyte and internal standard must be equivalent.

$$RF = \frac{(A_x)(Q_{is})}{(A_{is})(Q_x)}$$

where:  $A_x$  = integrated abundance of the quantitation ion of the analyte.  
 $A_{is}$  = integrated abundance of the quantitation ion of the internal standard.  
 $Q_x$  = quantity of analyte purged in ng or concentration units.  
 $Q_{is}$  = quantity of internal standard purged in ng or concentration units.

- 9.2.6.1 For each analyte and surrogate, calculate the mean RF from the analyses of the CAL solutions. Calculate the standard deviation (SD) and the relative standard deviation (RSD) from each mean:  $RSD = 100 (SD/M)$ . If the RSD of any analyte or surrogate mean RF exceeds 20%, either analyze additional aliquots of appropriate CAL solutions to obtain an acceptable RSD of RFs over the entire concentration range, or take action to improve GC/MS performance. See Sect. 9.2.7.

- 9.2.7 As an alternative to calculating mean response factors and applying the RSD test, use the GC/MS data system software or other available software to generate a second or third order regression calibration curve.

- 9.3 Continuing calibration check. Verify the MS tune and initial calibration at the beginning of each 8-hr work shift during which analyses are performed using the following procedure.

- 9.3.1 Introduce into the GC (either by purging a laboratory reagent blank or making a syringe injection) 25 ng of BFB and acquire a mass spectrum that includes data for  $m/z$  35-260. If the spectrum does not meet all criteria (Table 2), the MS must be

retuned and adjusted to meet all criteria before proceeding with the continuing calibration check.

- 9.3.2 Purge a medium concentration CAL solution and analyze with the same conditions used during the initial calibration.
- 9.3.3 Demonstrate acceptable performance for the criteria shown in Sect. 9.2.4.
- 9.3.4 Determine that the absolute areas of the quantitation ions of the internal standard and surrogates have not decreased by more than 30% from the areas measured in the most recent continuing calibration check, or by more than 50% from the areas measured during initial calibration. If these areas have decreased by more than these amounts, adjustments must be made to restore system sensitivity. These adjustments may require cleaning of the MS ion source, or other maintenance as indicated in Sect. 9.3.6, and recalibration. Control charts are useful aids in documenting system sensitivity changes.
- 9.3.5 Calculate the RF for each analyte and surrogate from the data measured in the continuing calibration check. The RF for each analyte and surrogate must be within 30% of the mean value measured in the initial calibration. Alternatively, if a second or third order regression is used, the point from the continuing calibration check for each analyte and surrogate must fall, within the analyst's judgement, on the curve from the initial calibration. If these conditions do not exist, remedial action must be taken which may require re-initial calibration.
- 9.3.6 Some possible remedial actions. Major maintenance such as cleaning an ion source, cleaning quadrupole rods, etc. require returning to the initial calibration step.
  - 9.3.6.1 Check and adjust GC and/or MS operating conditions; check the MS resolution, and calibrate the mass scale.
  - 9.3.6.2 Clean or replace the splitless injection liner; silanize a new injection liner.
  - 9.3.6.3 Flush the GC column with solvent according to manufacturer's instructions.
  - 9.3.6.4 Break off a short portion (about 1 meter) of the column from the end near the injector; or replace GC column. This action will cause a change in retention times.
  - 9.3.6.5 Prepare fresh CAL solutions, and repeat the initial calibration step.
  - 9.3.6.6 Clean the MS ion source and rods (if a quadrupole).



9.3.6.7 Replace any components that allow analytes to come into contact with hot metal surfaces.

9.3.6.8 Replace the MS electron multiplier, or any other faulty components.

9.4 Optional calibration for vinyl chloride using a certified gaseous mixture of vinyl chloride in nitrogen can be accomplished by the following steps.

9.4.1 Fill the purging device with 25.0 mL (or 5-mL) of reagent water or aqueous calibration standard.

9.4.2 Start to purge the aqueous mixture. Inject a known volume (between 100 and 2000  $\mu$ L) of the calibration gas (at room temperature) directly into the purging device with a gas tight syringe. Slowly inject the gaseous sample through a septum seal at the top of the purging device at 2000  $\mu$ L/min. If the injection of the standard is made through the aqueous sample inlet port, flush the dead volume with several mL of room air or carrier gas. Inject the gaseous standard before 5 min of the 11-min purge time have elapsed.

9.4.3 Determine the aqueous equivalent concentration of vinyl chloride standard, in  $\mu$ g/L, injected with the equation:

$$S = 0.102 (C)(V)$$

where S = Aqueous equivalent concentration  
of vinyl chloride standard in  $\mu$ g/L;  
C = Concentration of gaseous standard in ppm (v/v);  
V = Volume of standard injected in milliliters.

## 10. QUALITY CONTROL

10.1 Quality control (QC) requirements are the initial demonstration of laboratory capability followed by regular analyses of laboratory reagent blanks, field reagent blanks, and laboratory fortified blanks. The laboratory must maintain records to document the quality of the data generated. Additional quality control practices are recommended.

10.2 Initial demonstration of low system background. Before any samples are analyzed, it must be demonstrated that a laboratory reagent blank (LRB) is reasonably free of contamination that would prevent the determination of any analyte of concern. Sources of background contamination are glassware, purge gas, sorbants, and equipment. Background contamination must be reduced to an acceptable level before proceeding with the next section. In general, background from method analytes should be below the method detection limit.

- 10.3 Initial demonstration of laboratory accuracy and precision. Analyze five to seven replicates of a laboratory fortified blank containing each analyte of concern at a concentration in the range of 0.2-5  $\mu\text{g/L}$  (see regulations and maximum contaminant levels for guidance on appropriate concentrations).
- 10.3.1 Prepare each replicate by adding an appropriate aliquot of a quality control sample to reagent water. If a quality control sample containing the method analytes is not available, a primary dilution standard made from a source of reagents different than those used to prepare the calibration standards may be used. Also add the appropriate amounts of internal standard and surrogates if they are being used. Analyze each replicate according to the procedures described in Section 11, and on a schedule that results in the analyses of all replicates over a period of several days.
- 10.3.2 Calculate the measured concentration of each analyte in each replicate, the mean concentration of each analyte in all replicates, and mean accuracy (as mean percentage of true value) for each analyte, and the precision (as relative standard deviation, RSD) of the measurements for each analyte. Calculate the MDL of each analyte using the procedures described in Sect. 13.2 (2).
- 10.3.3 For each analyte and surrogate, the mean accuracy, expressed as a percentage of the true value, should be 80-120% and the RSD should be <20%. Some analytes, particularly the early eluting gases and late eluting higher molecular weight compounds, are measured with less accuracy and precision than other analytes. The method detection limits must be sufficient to detect analytes at the required levels. If these criteria are not met for an analyte, take remedial action and repeat the measurements for that analyte to demonstrate acceptable performance before samples are analyzed.
- 10.3.4 Develop and maintain a system of control charts to plot the precision and accuracy of analyte and surrogate measurements as a function of time. Charting of surrogate recoveries is an especially valuable activity since these are present in every sample and the analytical results will form a significant record of data quality.
- 10.4 Monitor the integrated areas of the quantitation ions of the internal standards and surrogates in continuing calibration checks. These should remain reasonably constant over time. A drift of more than 50% in any area is indicative of a loss in sensitivity, and the problem must be found and corrected. These integrated areas should also be reasonably constant in laboratory fortified blanks and samples.

- 10.5 Laboratory reagent blanks. With each batch of samples processed as a group within a work shift, analyze a laboratory reagent blank to determine the background system contamination. A FRB (Sect. 10.7) may be used in place of a LRB.
- 10.6 With each batch of samples processed as a group within a work shift, analyze a single laboratory fortified blank (LFB) containing each analyte of concern at a concentration as determined in 10.3. If more than 20 samples are included in a batch, analyze one LFB for every 20 samples. Use the procedures described in 10.3.3 to evaluate the accuracy of the measurements, and to estimate whether the method detection limits can be obtained. If acceptable accuracy and method detection limits cannot be achieved, the problem must be located and corrected before further samples are analyzed. Add these results to the on-going control charts to document data quality.
- 10.7 With each set of field samples a field reagent blank (FRB) should be analyzed. The results of these analyses will help define contamination resulting from field sampling and transportation activities. If the FRB shows unacceptable contamination, a LRB must be measured to define the source of the impurities.
- 10.8 At least quarterly, replicates of laboratory fortified blanks should be analyzed to determine the precision of the laboratory measurements. Add these results to the on-going control charts to document data quality.
- 10.9 At least quarterly, analyze a quality control sample (QCS) from an external source. If measured analyte concentrations are not of acceptable accuracy, check the entire analytical procedure to locate and correct the problem source.
- 10.10 Sample matrix effects have not been observed when this method is used with distilled water, reagent water, drinking water, and ground water. Therefore, analysis of a laboratory fortified sample matrix (LFM) is not required. It is recommended that sample matrix effects be evaluated at least quarterly using the QCS described in 10.9.
- 10.11 Numerous other quality control measures are incorporated into other parts of this procedure, and serve to alert the analyst to potential problems.

## 11. PROCEDURE

### 11.1 SAMPLE INTRODUCTION AND PURGING

- 11.1.1 This method is designed for a 25-mL sample volume, but a smaller (5 mL) sample volume is recommended if the GC/MS system has adequate sensitivity to achieve the required method detection limits. Adjust the purge gas (nitrogen or helium) flow rate to 40 mL/min. Attach the trap inlet to the

purging device and open the syringe valve on the purging device.

- 11.1.2 Remove the plungers from two 25-mL (or 5-mL depending on sample size) syringes and attach a closed syringe valve to each. Warm the sample to room temperature, open the sample bottle, and carefully pour the sample into one of the syringe barrels to just short of overflowing. Replace the syringe plunger, invert the syringe, and compress the sample. Open the syringe valve and vent any residual air while adjusting the sample volume to 25.0-mL (or 5-mL). For samples and blanks, add 5- $\mu$ L of the fortification solution containing the internal standard and the surrogates to the sample through the syringe valve. For calibration standards and laboratory fortified blanks, add 5- $\mu$ L of the fortification solution containing the internal standard only. Close the valve. Fill the second syringe in an identical manner from the same sample bottle. Reserve this second syringe for a reanalysis if necessary.
- 11.1.3 Attach the sample syringe valve to the syringe valve on the purging device. Be sure that the trap is cooler than 25°C, then open the sample syringe valve and inject the sample into the purging chamber. Close both valves and initiate purging. Purge the sample for 11.0 min at ambient temperature.

## 11.2 SAMPLE DESORPTION

- 11.2.1 Non-cryogenic interface -- After the 11-min purge, place the purge and trap system in the desorb mode and preheat the trap to 180°C without a flow of desorption gas. Then simultaneously start the flow of desorption gas at 15-mL/min for about 4 min, begin the temperature program of the gas chromatograph, and start data acquisition.
- 11.2.2 Cryogenic interface -- After the 11-min purge, place the purge and trap system in the desorb mode, make sure the cryogenic interface is a -150°C or lower, and rapidly heat the trap to 180°C while backflushing with an inert gas at 4 mL/min for about 5 min. At the end of the 5 min desorption cycle, rapidly heat the cryogenic trap to 250°C, and simultaneously begin the temperature program of the gas chromatograph, and start data acquisition.
- 11.2.3 While the trapped components are being introduced into the gas chromatograph (or cryogenic interface), empty the purging device using the sample syringe and wash the chamber with two 25-mL flushes of reagent water. After the purging device has been emptied, leave syringe valve open to allow the purge gas to vent through the sample introduction needle.

- 11.3 GAS CHROMATOGRAPHY/MASS SPECTROMETRY -- Acquire and store data over the mass range 35-260 with a total cycle time (including scan overhead time) of 2 sec or less. Cycle time must be adjusted to measure five or more spectra during the elution of each GC peak. Several alternative temperature programs can be used.
- 11.3.1 Single ramp linear temperature program for wide bore columns 1 and 2 with a jet separator. Adjust the helium carrier gas flow rate to about 15 mL/min. The column temperature is reduced 10°C and held for 5 min from the beginning of desorption, then programmed to 160°C at 6°C/min, and held until all components have eluted.
- 11.3.2 Multi-ramp linear temperature program for wide bore column 2 with the open split interface. Adjust the helium carrier gas flow rate to about 4.6 mL/min. The column temperature is reduced 10°C and held for 6 min from the beginning of desorption, then heated to 70°C at 10°C/min, heated to 120°C at 5°C/min, heated to 180°C at 8°C/min, and held at 180°C until all compounds have eluted.
- 11.3.3 Single ramp linear temperature program for narrow bore column 3 with a cryogenic interface. Adjust the helium carrier gas flow rate to about 4 mL/min. The column temperature is reduced 10°C and held for 5 min from the beginning of vaporization from the cryogenic trap, programmed at 6°C/min for 10 min, then 15°C/min for 5 min to 145°C, and held until all components have eluted.
- 11.4 TRAP RECONDITIONING -- After desorbing the sample for 4 min, recondition the trap by returning the purge and trap system to the purge mode. Wait 15 sec, then close the syringe valve on the purging device to begin gas flow through the trap. Maintain the trap temperature at 180°C. After approximately 7 min, turn off the trap heater and open the syringe valve to stop the gas flow through the trap. When the trap is cool, the next sample can be analyzed.
- 11.5 TERMINATION OF DATA ACQUISITION -- When all the sample components have eluted from the GC, terminate MS data acquisition. Use appropriate data output software to display full range mass spectra and appropriate plots of ion abundance as a function of time. If any ion abundance exceeds the system working range, dilute the sample aliquot in the second syringe with reagent water and analyze the diluted aliquot.
- 11.6 IDENTIFICATION OF ANALYTES -- Identify a sample component by comparison of its mass spectrum (after background subtraction) to a reference spectrum in the user-created data base. The GC retention time of the sample component should be within three standard deviations of the mean retention time of the compound in the calibration mixture.

- 11.6.1 In general, all ions that are present above 10% relative abundance in the mass spectrum of the standard should be present in the mass spectrum of the sample component and should agree within absolute 20%. For example, if an ion has a relative abundance of 30% in the standard spectrum, its abundance in the sample spectrum should be in the range of 10 to 50%. Some ions, particularly the molecular ion, are of special importance, and should be evaluated even if they are below 10% relative abundance.
- 11.6.2 Identification requires expert judgement when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When GC peaks obviously represent more than one sample component (i.e., broadened peak with shoulder(s) or valley between two or more maxima), appropriate analyte spectra and background spectra can be selected by examining plots of characteristic ions for tentatively identified components. When analytes coelute (i.e., only one GC peak is apparent), the identification criteria can be met but each analyte spectrum will contain extraneous ions contributed by the coeluting compound. Because purgeable organic compounds are relatively small molecules and produce comparatively simple mass spectra, this is not a significant problem for most method analytes.
- 11.6.3 Structural isomers that produce very similar mass spectra can be explicitly identified only if they have sufficiently different GC retention times. Acceptable resolution is achieved if the height of the valley between two peaks is less than 25% of the average height of the two peaks. Otherwise, structural isomers are identified as isomeric pairs. Two of the three isomeric xylenes and two of the three dichlorobenzenes are examples of structural isomers that may not be resolved on the capillary columns. If unresolved, these groups of isomers must be reported as isomeric pairs.
- 11.6.4 Methylene chloride and other background components appear in variable quantities in laboratory and field reagent blanks, and generally cannot be accurately measured. Subtraction of the concentration in the blank from the concentration in the sample is not acceptable because the concentration of the background in the blank is highly variable.

## 12. CALCULATIONS

- 12.1 Complete chromatographic resolution is not necessary for accurate and precise measurements of analyte concentrations if unique ions with adequate intensities are available for quantitation.

12.1.1 Calculate analyte and surrogate concentrations.

$$- \epsilon_x = \frac{(A_x)(Q_{is}) 1000}{(A_{is}) RF V}$$

where:  $C_x$  = concentration of analyte or surrogate in  $\mu\text{g/L}$  in the water sample.  
 $A_x$  = integrated abundance of the quantitation ion of the analyte in the sample.  
 $A_{is}$  = integrated abundance of the quantitation ion of the internal standard in the sample.  
 $Q_{is}$  = total quantity (in micrograms) of internal standard added to the water sample.  
 $V$  = original water sample volume in mL.  
 $RF$  = mean response factor of analyte from the initial calibration.

12.1.2 Alternatively, use the GC/MS system software or other available proven software to compute the concentrations of the analytes and surrogates from the second or third order regression curves.

12.1.3 Calculations should utilize all available digits of precision, but final reported concentrations should be rounded to an appropriate number of significant figures (one digit of uncertainty). Experience indicates that three significant figures may be used for concentrations above 99  $\mu\text{g/L}$ , two significant figures for concentrations between 1- 99  $\mu\text{g/L}$ , and one significant figure for lower concentrations.

12.1.4 Calculate the total trihalomethane concentration by summing the four individual trihalomethane concentrations in  $\mu\text{g/L}$ .

### 13. ACCURACY AND PRECISION

13.1 Single laboratory accuracy and precision data were obtained for the method analytes using laboratory fortified blanks with analytes at concentrations between 1 and 5  $\mu\text{g/L}$ . Four sets of results were obtained using the three columns specified (Sect. 6.3.2) and the open split, cryogenic, and jet separator interfaces (Sect. 6.3.3). These data are shown in Tables 4-6.

13.2 With these data, method detection limits were calculated using the formula (2):

$$MDL = S t_{(n-1, 1-\alpha = 0.99)}$$

where:

$t_{(n-1, 1-\alpha = 0.99)}$  = Student's t value for the 99% confidence level with n-1 degrees of freedom,

n = number of replicates

S = the standard deviation of the  
replicate analyses.

#### 14. REFERENCES

1. A. Alford-Stevens, J.W. Eichelberger, W.L. Budde, "Purgeable Organic Compounds in Water by Gas Chromatography/Mass Spectrometry, Method 524." Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio, February 1983.
2. Madding, C., "Volatile Organic Compounds in Water by Purge and Trap Capillary Column GC/MS", Proceedings of the Water Quality Technology Conference, American Water Works Association, Denver, CO, December, 1984.
3. Glaser, J.A., D.L. Foerst, G.D. McKee, S.A. Quave, and W.L. Budde, "Trace Analyses for Wastewaters, Environ. Sci. Technol., 15, 1426, 1981.
4. "Carcinogens-Working with Carcinogens," Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health, Publication No. 77-206, August, 1977.
5. "OSHA Safety and Health Standards, General Industry," (29CFR1910), Occupational Safety and Health Administration, OSHA 2206, (Revised, January 1976).
6. "Safety in Academic Chemistry Laboratories," American Chemical Society Publication, Committee on Chemical Safety, 3rd Edition, 1979.
7. Arrendale, R.F., R.F. Severson, and O.T. Chortyk, "Open Split Interface for Capillary Gas Chromatography/Mass Spectrometry", Anal. Chem. 1984, 56, 1533.
8. Flesch, J.J., P.S. Fair, "The Analysis of Cyanogen Chloride in Drinking Water," Proceedings of Water Quality Technology Conference, American Water Works Association, St. Louis, MO., November 14-16, 1988.



TABLE 1. MOLECULAR WEIGHTS AND QUANTITATION IONS FOR METHOD ANALYTES

Compound	MW <sup>a</sup>	Primary Quantitation Ion	Secondary Quantitation Ions
<u>Internal standard</u>			
Fluorobenzene	96	96	77
<u>Surrogates</u>			
4-Bromofluorobenzene	174	95	174, 176
1,2-Dichlorobenzene-d4	150	152	115, 150
<u>Target Analytes</u>			
Benzene	78	78	77
Bromobenzene	156	156	77, 158
Bromochloromethane	128	128	49, 130
Bromodichloromethane	162	83	85, 127
Bromoform	250	173	175, 252
Bromomethane	94	94	96
n-Butylbenzene	134	91	134
sec-Butylbenzene	134	105	134
tert-Butylbenzene	134	119	91
Carbon tetrachloride	152	117	119
Chlorobenzene	112	112	77, 114
Chloroethane	64	64	66
Chloroform	118	83	85
Chloromethane	50	50	52
2-Chlorotoluene	126	91	126
4-Chlorotoluene	126	91	126
Dibromochloromethane	206	129	127
1,2-Dibromo-3-Chloropropane	234	75	155, 157
1,2-Dibromoethane	186	107	109, 188
Dibromomethane	172	93	95, 174
1,2-Dichlorobenzene	146	146	111, 148
1,3-Dichlorobenzene	146	146	111, 148
1,4-Dichlorobenzene	146	146	111, 148
Dichlorodifluoromethane	120	85	87
1,1-Dichloroethane	98	63	65, 83
1,2-Dichloroethane	98	62	98
1,1-Dichloroethene	96	96	61, 63
cis-1,2-Dichloroethene	96	96	61, 98
trans-1,2-Dichloroethene	96	96	61, 98
1,2-Dichloropropane	112	63	112
1,3-Dichloropropane	112	76	78
2,2-Dichloropropane	112	77	97
1,1-Dichloropropene	110	75	110, 77

TABLE 1. (continued)

Compound	MW <sup>a</sup>	Primary Quantitation Ion	Secondary Quantitation Ions
cis-1,3-dichloropropene	110	75	110
trans-1,3-dichloropropene	110	75	110
Ethylbenzene	106	91	106
Hexachlorobutadiene	258	225	260
Isopropylbenzene	120	105	120
4-Isopropyltoluene	134	119	134, 91
Methylene chloride	84	84	86, 49
Naphthalene	128	128	
n-Propylbenzene	120	91	120
Styrene	104	104	78
1,1,1,2-Tetrachloroethane	166	131	133, 119
1,1,2,2-Tetrachloroethane	166	83	131, 85
Tetrachloroethene	164	166	168, 129
Toluene	92	92	91
1,2,3-Trichlorobenzene	180	180	182
1,2,4-Trichlorobenzene	180	180	182
1,1,1-Trichloroethane	132	97	99, 61
1,1,2-Trichloroethane	132	83	97, 85
Trichloroethene	130	95	130, 132
Trichlorofluoromethane	136	101	103
1,2,3-Trichloropropane	146	75	77
1,2,4-Trimethylbenzene	120	105	120
1,3,5-Trimethylbenzene	120	105	120
Vinyl Chloride	62	62	64
o-Xylene	106	106	91
m-Xylene	106	106	91
p-Xylene	106	106	91

<sup>a</sup>Monoisotopic molecular weight calculated from the atomic masses of the isotopes with the smallest masses.

TABLE 2. CHROMATOGRAPHIC RETENTION TIMES FOR METHOD ANALYTES  
ON THREE COLUMNS WITH FOUR SETS OF CONDITIONS<sup>a</sup>

Compound	Retention		Time (min:sec)	
	Column 1 <sup>b</sup>	Column 2 <sup>b</sup>	Column 2 <sup>c</sup>	Column 3 <sup>d</sup>
<u>Internal standard</u>				
Fluorobenzene	8:49	6:27	14:06	8:03
<u>Surrogates</u>				
4-Bromofluorobenzene	18:38	15:43	23:38	
1,2-Dichlorobenzene-d4	22:16	19:08	27:25	
<u>Target Analytes</u>				
Benzene	8:14	5:40	13:30	7:25
Bromobenzene	18:57	15:52	24:00	16:25
Bromochloromethane	6:44	4:23	12:22	5:38
Bromodichloromethane	10:35	8:29	15:48	9:20
Bromoform	17:56	14:53	22:46	15:42
Bromomethane	2:01	0:58	4:48	1:17
n-Butylbenzene	22:13	19:29	27:32	17:57
sec-Butylbenzene	20:47	18:05	26:08	17:28
tert-Butylbenzene	20:17	17:34	25:36	17:19
Carbon Tetrachloride	7:37	5:16	13:10	7:25
Chlorobenzene	15:46	13:01	20:40	14:20
Chloroethane	2:05	1:01		1:27
Chloroform	6:24	4:48	12:36	5:33
Chloromethane	1:38	0:44	3:24	0:58
2-Chlorotoluene	19:20	16:25	24:32	16:44
4-Chlorotoluene	19:30	16:43	24:46	16:49
Cyanogen chloride				1:03
Dibromochloromethane	14:23	11:51	19:12	12:48
1,2-Dibromo-3-Chloropropane	24:32	21:05		18:02
1,2-Dibromoethane	14:44	11:50	19:24	13:36
Dibromomethane	10:39	7:56	15:26	9:05
1,2-Dichlorobenzene	22:31	19:10	27:26	17:47
1,3-Dichlorobenzene	21:13	18:08	26:22	17:28
1,4-Dichlorobenzene	21:33	18:23	26:36	17:38
Dichlorodifluoromethane	1:33	0:42	3:08	0:53
1,1-Dichloroethane	4:51	2:56	10:48	4:02
1,2-Dichloroethane	8:24	5:50	13:38	7:00
1,1-Dichloroethene	2:53	1:34	7:50	2:20
cis-1,2-Dichloroethene	6:11	3:54	11:56	5:04
trans-1,2-Dichloroethene	3:59	2:22	9:54	3:32
1,2-Dichloropropane	10:05	7:40	15:12	8:56
1,3-Dichloropropane	14:02	11:19	18:42	12:29
2,2-Dichloropropane	6:01	3:48	11:52	5:19
1,1-Dichloropropene	7:49	5:17	13:06	7:10

TABLE 2. (continued)

Compound	Retention		Time (min:sec)	
	Column 1 <sup>b</sup>	Column 2 <sup>b</sup>	Column 2 <sup>c</sup>	Column 3 <sup>d</sup>
cis-1,3-dichloropropene			17:54	
trans-1,3-dichloropropene			16:42	
Ethylbenzene	15:59	13:23	21:00	14:44
Hexachlorobutadiene	26:59	23:41	32:04	19:14
Isopropylbenzene	13:04	15:28	23:18	16:25
4-Isopropyltoluene	21:12	18:31	26:30	17:38
Methylene Chloride	3:36	2:04	9:16	2:40
Naphthalene	27:10	23:31	32:12	19:04
n-Propylbenzene	19:04	16:25	24:20	16:49
Styrene	17:19	14:36	22:24	15:47
1,1,1,2-Tetrachloroethane	15:56	13:20	20:52	14:44
1,1,2,2-Tetrachloroethane	18:43	16:21	24:04	15:47
Tetrachloroethene	13:44	11:09	18:36	13:12
Toluene	12:26	10:00	17:24	11:31
1,2,3-Trichlorobenzene	27:47	24:11	32:58	19:14
1,2,4-Trichlorobenzene	26:33	23:05	31:30	18:50
1,1,1-Trichloroethane	7:16	4:50	12:50	6:46
1,1,2-Trichloroethane	13:25	11:03	18:18	11:59
Trichloroethene	9:35	7:16	14:48	9:01
Trichlorofluoromethane	2:16	1:11	6:12	1:46
1,2,3-Trichloropropane	19:01	16:14	24:08	16:16
1,2,4-Trimethylbenzene	20:20	17:42	31:30	17:19
1,3,5-Trimethylbenzene	19:28	16:54	24:50	16:59
Vinyl chloride	1:43	0:47	3:56	1:02
o-Xylene	17:07	14:31	22:16	15:47
m-Xylene	16:10	13:41	21:22	15:18
p-Xylene	16:07	13:41	21:18	15:18

<sup>a</sup>Columns 1-3 are those given in Sect. 6.3.2.1; retention times were measured from the beginning of thermal desorption from the trap (columns 1-2) or from the beginning of thermal release from the cryogenic interface (column 3).

<sup>b</sup>GC conditions given in Sect. 11.3.1.

<sup>c</sup>GC conditions given in Sect. 11.3.2.

<sup>d</sup>GC conditions given in Sect. 11.3.3.

TABLE 3. ION ABUNDANCE CRITERIA FOR 4-BROMOFLUOROBENZENE (BFB)

Mass (M/z)	Relative Abundance Criteria
50	15 to 40% of mass 95
75	30 to 80% of mass 95
95	Base Peak, 100% Relative Abundance
96	5 to 9% of mass 95
173	< 2% of mass 174
174	> 50% of mass 95
175	5 to 9% of mass 174
176	> 95% but < 101% of mass 174
177	5 to 9% of mass 176

TABLE 4. ACCURACY AND PRECISION DATA FROM 16-31 DETERMINATIONS OF THE METHOD ANALYTES IN REAGENT WATER USING WIDE BORE CAPILLARY COLUMN 1<sup>a</sup>

Compound	True Conc. Range ( $\mu\text{g/L}$ )	Mean Accuracy (% of True Value)	Rel. Std. Dev. (%)	Method Det. Limit ( $\mu\text{g/L}$ )
Benzene	0.1-10	97	5.7	0.04
Bromobenzene	0.1-10	100	5.5	0.03
Bromochloromethane	0.5-10	90	6.4	0.04
Bromodichloromethane	0.1-10	95	6.1	0.08
Bromoform	0.5-10	101	6.3	0.12
Bromomethane	0.5-10	95	8.2	0.11
n-Butylbenzene	0.5-10	100	7.6	0.11
sec-Butylbenzene	0.5-10	100	7.6	0.13
tert-Butylbenzene	0.5-10	102	7.3	0.14
Carbon tetrachloride	0.5-10	84	8.8	0.21
Chlorobenzene	0.1-10	98	5.9	0.04
Chloroethane	0.5-10	89	9.0	0.10
Chloroform	0.5-10	90	6.1	0.03
Chloromethane	0.5-10	93	8.9	0.13
2-Chlorotoluene	0.1-10	90	6.2	0.04
4-Chlorotoluene	0.1-10	99	8.3	0.06
Dibromochloromethane	0.1-10	92	7.0	0.05
1,2-Dibromo-3-chloropropane	0.5-10	83	19.9	0.26
1,2-Dibromoethane	0.5-10	102	3.9	0.06
Dibromomethane	0.5-10	100	5.6	0.24
1,2-Dichlorobenzene	0.1-10	93	6.2	0.03
1,3-Dichlorobenzene	0.5-10	99	6.9	0.12
1,4-Dichlorobenzene	0.2-20	103	6.4	0.03
Dichlorodifluoromethane	0.5-10	90	7.7	0.10
1,1-Dichloroethane	0.5-10	96	5.3	0.04
1,2-Dichloroethane	0.1-10	95	5.4	0.06
1,1-Dichloroethene	0.1-10	94	6.7	0.12
cis-1,2 Dichloroethene	0.5-10	101	6.7	0.12
trans-1,2-Dichloroethene	0.1-10	93	5.6	0.06
1,2-Dichloropropane	0.1-10	97	6.1	0.04
1,3-Dichloropropane	0.1-10	96	6.0	0.04
2,2-Dichloropropane	0.5-10	86	16.9	0.35
1,1-Dichloropropene	0.5-10	98	8.9	0.10
cis-1,2-Dichloropropene				
trans-1,2-Dichloropropene				
Ethylbenzene	0.1-10	99	8.6	0.06
Hexachlorobutadiene	0.5-10	100	6.8	0.11
Isopropylbenzene	0.5-10	101	7.6	0.15
4-Isopropyltoluene	0.1-10	99	6.7	0.12
Methylene chloride	0.1-10	95	5.3	0.03
Naphthalene	0.1-100	104	8.2	0.04
n-Propylbenzene	0.1-10	100	5.8	0.04
Styrene	0.1-100	102	7.2	0.04

TABLE 4. (Continued)

Compound	True Conc. Range ( $\mu\text{g/L}$ )	Mean Accuracy (% of True Value)	Rel. Std. Dev. (%)	Method Det. Limit ( $\mu\text{g/L}$ )
1,1,1,2-Tetrachloroethane	0.5-10	90	6.8	0.05
1,1,2,2-Tetrachloroethane	0.1-10	91	6.3	0.04
Tetrachloroethene	0.5-10	89	6.8	0.14
Toluene	0.5-10	102	8.0	0.11
1,2,3-Trichlorobenzene	0.5-10	109	8.6	0.03
1,2,4-Trichlorobenzene	0.5-10	108	8.3	0.04
1,1,1-Trichloroethane	0.5-10	98	8.1	0.08
1,1,2-Trichloroethane	0.5-10	104	7.3	0.10
Trichloroethene	0.5-10	90	7.3	0.19
Trichlorofluoromethane	0.5-10	89	8.1	0.08
1,2,3-Trichloropropane	0.5-10	108	14.4	0.32
1,2,4-Trimethylbenzene	0.5-10	99	8.1	0.13
1,3,5-Trimethylbenzene	0.5-10	92	7.4	0.05
Vinyl chloride	0.5-10	98	6.7	0.17
o-Xylene	0.1-31	103	7.2	0.11
m-Xylene	0.1-10	97	6.5	0.05
p-Xylene	0.5-10	104	7.7	0.13

<sup>a</sup>Data obtained by Robert W. Slater using column 1 with a jet separator interface and a quadrupole mass spectrometer (Sect. 11.3.1) with analytes divided among three solutions.

TABLE 5. ACCURACY AND PRECISION DATA FROM SEVEN DETERMINATIONS OF THE METHOD ANALYTES IN REAGENT WATER USING THE CRYOGENIC TRAPPING OPTION AND A NARROW BORE CAPILLARY COLUMN 3<sup>a</sup>

Compound	True Conc. (ug/L)	Mean Accuracy (% of True Value)	Rel. Std. Dev. (%)	Method Dect. Limit (ug/L)
Benzene	0.1	99	6.2	0.03
Bromobenzene	0.5	97	7.4	0.11
Bromochloromethane	0.5	97	5.8	0.07
Bromodichloromethane	0.1	100	4.6	0.03
Bromoform	0.1	99	5.4	0.20
Bromomethane	0.1	99	7.1	0.06
n-Butylbenzene	0.5	94	6.0	0.03
sec-Butylbenzene	0.5	90	7.1	0.12
tert-Butylbenzene	0.5	90	2.5	0.33
Carbon tetrachloride	0.1	92	6.8	0.08
Chlorobenzene	0.1	91	5.8	0.03
Chloroethane	0.1	100	5.8	0.02
Chloroform	0.1	95	3.2	0.02
Chloromethane	0.1	99	4.7	0.05
2-Chlorotoluene	0.1	99	4.6	0.05
4-Chlorotoluene	0.1	96	7.0	0.05
Cyanogen chloride <sup>b</sup>		92	10.6	0.30
Dibromochloromethane	0.1	99	5.6	0.07
1,2-Dibromo-3-chloropropane	0.1	92	10.0	0.05
1,2-Dibromoethane	0.1	97	5.6	0.02
Dibromomethane	0.1	93	6.9	0.03
1,2-Dichlorobenzene	0.1	97	3.5	0.05
1,3-Dichlorobenzene	0.1	99	6.0	0.05
1,4-Dichlorobenzene	0.1	93	5.7	0.04
Dichlorodifluoromethane	0.1	99	8.8	0.11
1,1-Dichloroethane	0.1	98	6.2	0.03
1,2-Dichloroethane	0.1	100	6.3	0.02
1,1-Dichloroethene	0.1	95	9.0	0.05
cis-1,2 Dichloroethene	0.1	100	3.7	0.06
trans-1,2-Dichloroethene	0.1	98	7.2	0.03
1,2-Dichloropropane	0.1	96	6.0	0.02
1,3-Dichloropropane	0.1	99	5.8	0.04
2,2-Dichloropropane	0.1	99	4.9	0.05
1,1-Dichloropropene	0.1	98	7.4	0.02
cis-1,3-Dichloropropene				
trans-1,3-Dichloropropene				
Ethylbenzene	0.1	99	5.2	0.03
Hexachlorobutadiene	0.1	100	6.7	0.04
Isopropylbenzene	0.5	98	6.4	0.10
4-Isopropyltoluene	0.5	87	13.0	0.26
Methylene chloride	0.5	97	13.0	0.09
Naphthalene	0.1	98	7.2	0.04



TABLE 5. (Continued)

Compound	True Conc. ( $\mu\text{g/L}$ )	Mean Accuracy (% of True Value)	Rel. Std. Dev. (%)	Method Dect. Limit ( $\mu\text{g/L}$ )
n-Propylbenzene	0.1	99	6.6	0.06
Styrene	0.1	96	19.0	0.06
1,1,1,2-Tetrachloroethane	0.1	100	4.7	0.04
1,1,2,2-Tetrachloroethane	0.5	100	12.0	0.20
Tetrachloroethene	0.1	96	5.0	0.05
Toluene	0.1	100	5.9	0.08
1,2,3-Trichlorobenzene	0.1	98	8.9	0.04
1,2,4-Trichlorobenzene	0.1	91	16.0	0.20
1,1,1-Trichloroethane	0.1	100	4.0	0.04
1,1,2-Trichloroethane	0.1	98	4.9	0.03
Trichloroethene	0.1	96	2.0	0.02
Trichlorofluoromethane	0.1	97	4.6	0.07
1,2,3-Trichloropropane	0.1	96	6.5	0.03
1,2,4-Trimethylbenzene	0.1	96	6.5	0.04
1,3,5-Trimethylbenzene	0.1	99	4.2	0.02
Vinyl chloride	0.1	96	0.2	0.04
o-Xylene	0.1	94	7.5	0.06
m-Xylene	0.1	94	4.6	0.03
p-Xylene	0.1	97	6.1	0.06

<sup>a</sup>Data obtained by Caroline A. Madding using column 3 with a cryogenic interface and a quadrupole mass spectrometer (Sect 11.3.3).

<sup>b</sup>Reference 8.

TABLE 6. ACCURACY AND PRECISION DATA FROM SEVEN DETERMINATIONS  
OF THE METHOD ANALYTES IN REAGENT WATER USING WIDE BORE  
CAPILLARY COLUMN 2<sup>a</sup>

Compound	No. <sup>b</sup>	Mean Accuracy (% of True Value, 2 µg/L Conc.)		Mean Accuracy (% of True Value, 0.2 µg/L Conc.)	
			RSD (%)		RSD (%)
<u>Internal Standard</u>					
Fluorobenzene	1	-	-	-	-
<u>Surrogates</u>					
4-Bromofluorobenzene	2	98	1.8	96	1.3
1,2-Dichlorobenzene-d <sub>4</sub>	3	97	3.2	95	1.7
<u>Target Analytes</u>					
Benzene	37	97	4.4	113	1.8
Bromobenzene	38	102	3.0	101	1.9
Bromochloromethane	4	99	5.2	102	2.9
Bromodichloromethane	5	96	1.8	100	1.8
Bromoform	6	89	2.4	90	2.2
Bromomethane	7	55	27.	52	6.7
n-Butylbenzene	39	89	4.8	87	2.3
sec-Butylbenzene	40	102	3.5	100	2.8
tert-Butylbenzene	41	101	4.5	100	2.9
Carbon tetrachloride	8	84	3.2	92	2.6
Chlorobenzene	42	104	3.1	103	1.6
Chloroethane <sup>c</sup>					
Chloroform	9	97	2.0	95	2.1
Chloromethane	10	110	5.0	d	
2-Chlorotoluene	43	91	2.4	108	3.1
4-Chlorotoluene	44	89	2.0	108	4.4
Dibromochloromethane	11	95	2.7	100	3.0
1,2-Dibromo-3-chloropropane <sup>c</sup>					
1,2-Dibromoethane <sup>c</sup>					
Dibromomethane	13	99	2.1	95	2.2
1,2-Dichlorobenzene	45	93	2.7	94	5.1
1,3-Dichlorobenzene	46	100	4.0	87	2.3
1,4-Dichlorobenzene	47	98	4.1	94	2.8
Dichlorodifluoromethane	14	38	25.	d	
1,1-Dichloroethane	15	97	2.3	85	3.6
1,2-Dichloroethane	16	102	3.8	100	2.1
1,1-Dichloroethene	17	90	2.2	87	3.8
cis-1,2-Dichloroethene	18	100	3.4	89	2.9
trans-1,2-Dichloroethene	19	92	2.1	85	2.3

TABLE 6. (Continued)

Compound	No. <sup>b</sup>	Mean Accuracy (% of True Value, 2 $\mu$ g/L Conc.)		Mean Accuracy (% of True Value, 0.2 $\mu$ g/L Conc.)	
			RSD (%)		RSD (%)
1,2-Dichloropropane	20	102	2.2	103	2.9
1,3-Dichloropropane	21	92	3.7	93	3.2
2,2-Dichloropropane <sup>c</sup>					
1,1-Dichloropropene <sup>c</sup>					
cis-1,3-Dichloropropene <sup>c</sup>					
trans-1,3-Dichloropropene	25	96	1.7	99	2.1
Ethylbenzene	48	96	9.1	100	4.0
Hexachlorobutadiene	26	91	5.3	88	2.4
Isopropylbenzene	49	103	3.2	101	2.1
4-Isopropyltoluene	50	95	3.6	95	3.1
Methylene chloride	27	e		e	
Naphthalene	51	93	7.6	78	8.3
n-Propylbenzene	52	102	4.9	97	2.1
Styrene	53	95	4.4	104	3.1
1,1,1,2-Tetrachloroethane	28	99	2.7	95	3.8
1,1,2,2-Tetrachloroethane	29	101	4.6	84	3.6
Tetrachloroethene	30	97	4.5	92	3.3
Toluene	54	105	2.8	126	1.7
1,2,3-Trichlorobenzene	55	90	5.7	78	2.9
1,2,4-Trichlorobenzene	56	92	5.2	83	5.9
1,1,1-Trichloroethane	31	94	3.9	94	2.5
1,1,2-Trichloroethane	32	107	3.4	109	2.8
Trichloroethene	33	99	2.9	106	2.5
Trichlorofluoromethane	34	81	4.6	48	13.
1,2,3-Trichloropropane	35	97	3.9	91	2.8
1,2,4-Trimethylbenzene	57	93	3.1	106	2.2
1,3,5-Trimethylbenzene	58	88	2.4	97	3.2
Vinyl chloride	36	104	3.5	115	14.
o-Xylene	59	97	1.8	98	1.7
m-Xylene	60	f		f	
p-Xylene	61	98	2.3	103	1.4

<sup>a</sup>Data obtained by James W. Eichelberger using column 2 with the open split interface and an ion trap mass spectrometer (Sect. 11.3.2) with all method analytes in the same reagent water solution.

<sup>b</sup>Designation in Figures 1 and 2.

<sup>c</sup>Not measured; authentic standards were not available.

<sup>d</sup>Not found at 0.2  $\mu$ g/L.

<sup>e</sup>Not measured; methylene chloride was in the laboratory reagent blank.

<sup>f</sup>m-xylene coelutes with and cannot be distinguished from its isomer p-xylene, No 61.

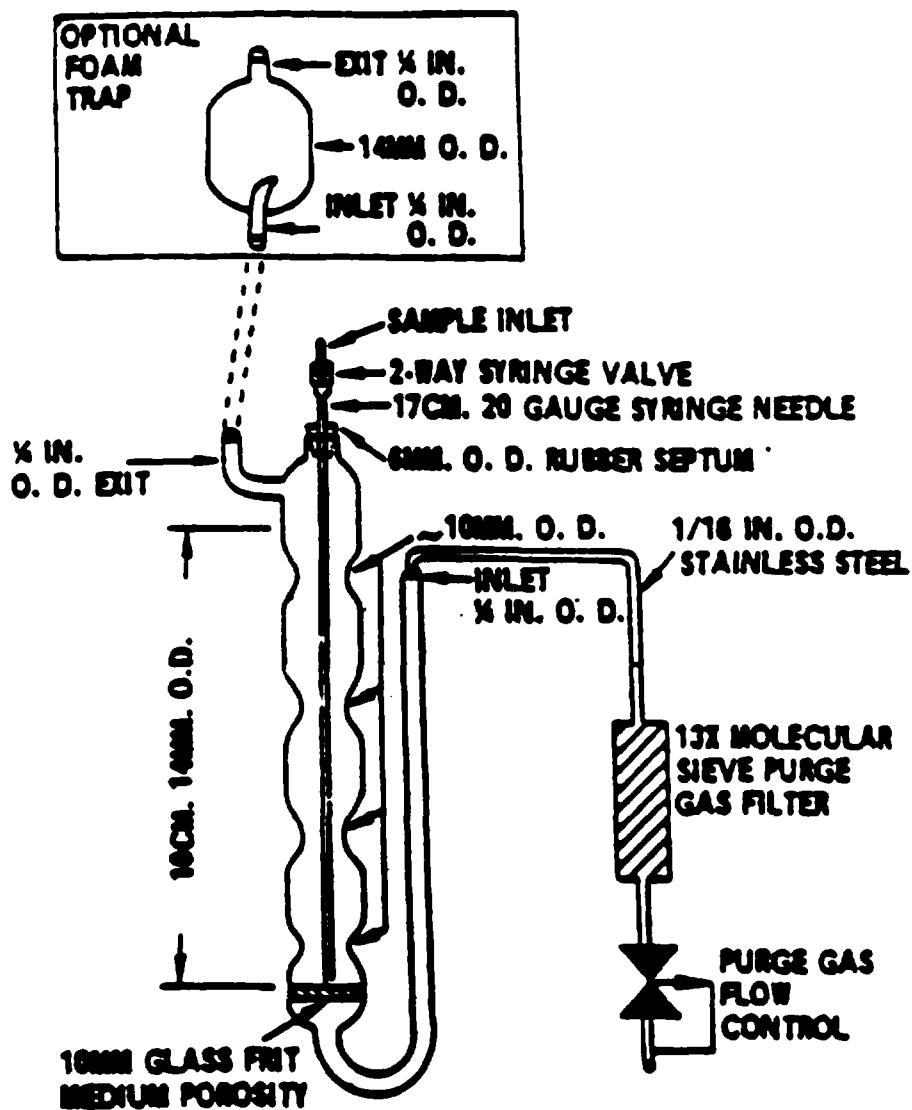


FIGURE 1. PURGING DEVICE

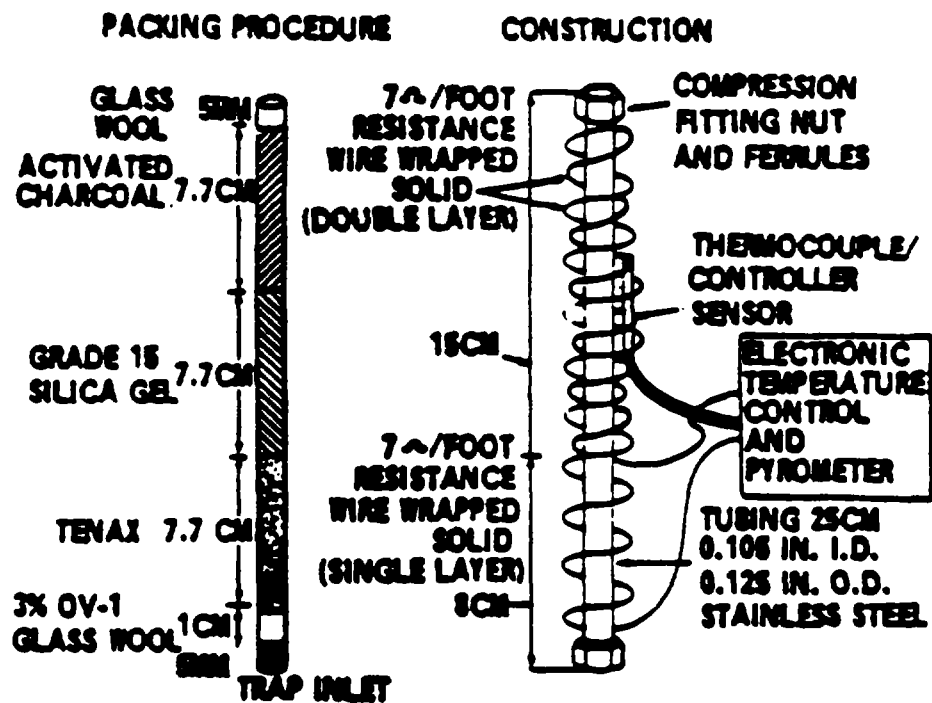


FIGURE 2. TRAP PACKINGS AND CONSTRUCTION TO INCLUDE DESORB CAPABILITY

FIGURE 3. NORMALIZED TOTAL ION CURRENT CHROMATOGRAM FROM A VOLATILE COMPOUND CALIBRATION MIXTURE CONTAINING 25 ng (5 µg/L) OF MOST COMPOUNDS. THE COMPOUND IDENTIFICATION NUMBERS ARE GIVEN IN TABLE 6.

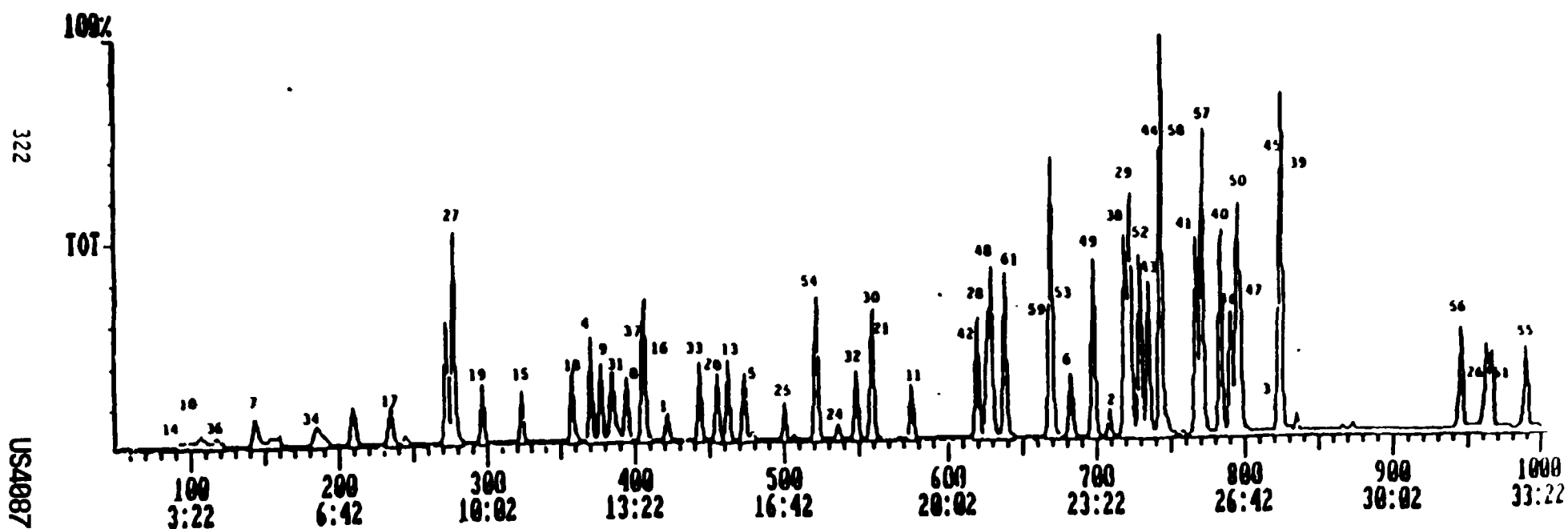
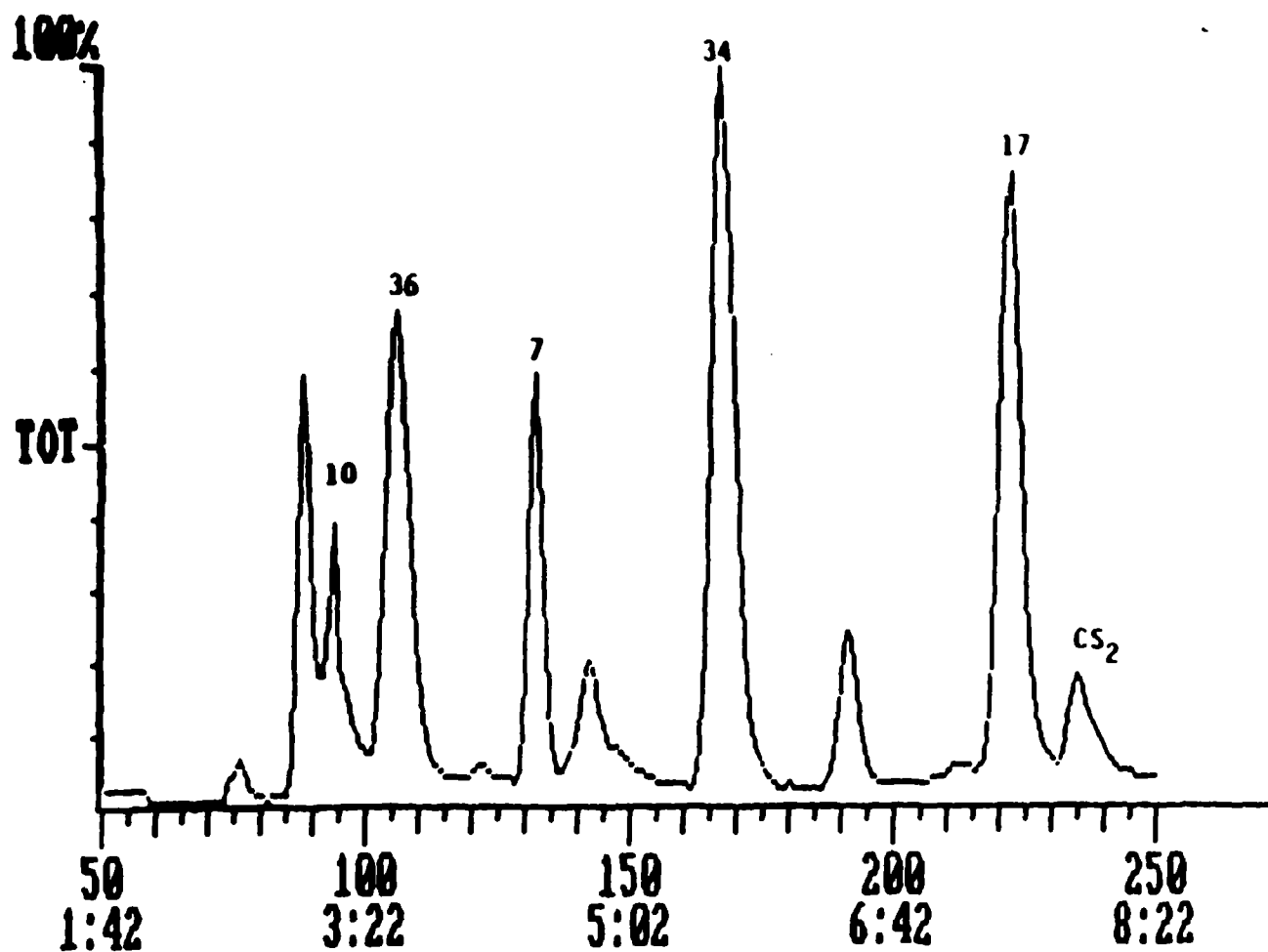


FIGURE 4. AMPLIFIED FIRST EIGHT MINUTES OF A TOTAL ION CURRENT CHROMATOGRAM FROM A VOLATILE COMPOUND CALIBRATION MIXTURE CONTAINING 25 ng (5 µg/L) OF EACH COMPONENT. THE COMPOUND IDENTIFICATION NUMBERS ARE GIVEN IN TABLE 6.



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US4088

**APPENDIX C**  
**CALIBRATION AND MAINTENANCE PROCEDURE FOR**  
**ANALYTICAL FIELD EQUIPMENT**



CALIBRATION AND MAINTENANCE PROCEDURE  
YSI MODEL 33 S-C-T METER

1.0 INTRODUCTION

This procedure presents steps to calibrate and maintain the YSI Model 33 S-C-T meter. Operation principles, procedures, and equipment specifications are presented in Procedure 5617002 and are not repeated here.

2.0 CALIBRATION

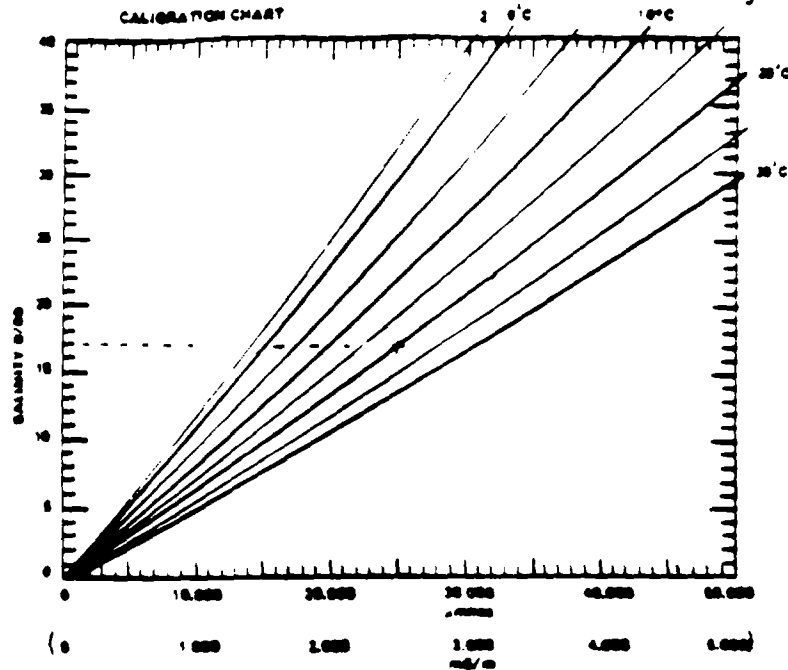
2.1 Temperature

2.1.1 Temperature Knob Setting

It is possible for the temperature knob to become loose or slip from its normal position. In an emergency, the dial can be repositioned. It must be emphasized that this is an emergency procedure only and that the instrument should be returned to the factory for proper recalibration - at the earliest opportunity.

To recalibrate the temperature setting:

1. Red line instrument and then place probe in sample of known conductivity.
2. Read and record the temperature and conductivity of the solution using appropriate settings. Leave probe in solution.
3. Determine the salinity of the solution by running a line vertically on Figure 1 until it intersects the appropriate 'C' line. From this intersection, extend a line horizontally to the left edge of the graph (Figure 1). This determines the salinity of the sample.



3. After five minutes, compare temperature of thermometer and instrument. If the instrument varies by  $\pm 1^{\circ}\text{C}$ , the instrument should be returned to the factory for calibration and maintenance.

## 2.2 Probe Cell Calibration

The YSI #3300 Series Cells are calibrated to absolute accuracy of  $\pm 1.5$  percent based on a standard solution of 0.01 molal KCl. To prepare this solution:

1. In a one liter flask, dissolve 0.745 grams of pure dry KCl until the solution is one kilogram in weight.
2. Use Table 1 and the temperature of the water to determine the conductivity of the solution just prepared. Note: Table 1 shows conductivity as if the distilled water was nonconductive. Since even high purity distilled water is slightly conductive, the measured conductivity will be higher by an amount equal to the water's conductivity.
3. Place probe in solution and measure conductivity. The conductivity of the solution plus the conductivity of the distilled water should not vary from the meter reading by  $\pm 1.5\%$ . If the reading is greater than  $1.5\%$ , clean the probe and then recheck the conductivity. If after cleaning it is not possible to measure the conductivity of the calibration solution within  $\pm 1.5\%$ , the probe and instrument should be returned to the manufacturer for calibration and maintenance.

## 3.0 MAINTENANCE

### 3.1 Batteries

The batteries should be replaced either (1) when it is not possible to red line the instrument, (2) after 200 hours of operation, or (3) every 6 months to reduce the danger of corrosion due to leaky batteries.

To replace batteries, remove the six screws from the rear plate. The battery holders are color coded. The positive (+ button) end must go on red.

Use two "D" size alkaline flashlight cells (Eveready E95 or equivalent).

### 3.2 Probe

#### 3.2.1 Cleaning

When the cell test indicates low readings, the probable cause is dirty electrodes. Hard water deposits, oils, and organic matter are the most likely contaminants.

TABLE 1 - CELL CALIBRATION DATA

Temperature (°C)	Conductivity (umhos/cm)
15	1141.5
16	1167.5
17	1193.6
18	1219.9
19	1246.4
20	1273.0
21	1299.7
22	1326.6
23	1353.6
24	1380.8
25	1408.1
26	1436.5
27	1463.2
28	1490.9
29	1518.7
30	1546.7

For convenient normal cleaning, soak the electrodes for 5 minutes with a locally available bathroom tile cleaner such as: "Rally, Tile, Porcelain, and Chrome Cleaner"; Johnson Wax "Envy, Instant Cleaner"; or Lysol Brand "Basin, Tub, Tile Cleaner".

For storage cleaning, a 5 minute soak in a solution made of 10 parts distilled water, 10 parts isopropyl alcohol, and 1 part HCl can be used.

Always rinse the probe in distilled water after cleaning and before storage.

CAUTION: Do not touch the electrodes inside the probe. Platinum black is very soft and can be scraped off.

If cleaning does not restore the probe performance, re-platinizing is required.

### 3.2.2 Probe Replatinizing

#### 1. Equipment required:

- a. YSI #3140 Platinizing Solution, 2 fluid ounce (3% platinum chloride dissolved in 0.025% lead acetate solution)
- b. YSI Model 33 meter
- c. 50 ml glass beaker or equivalent
- d. Distilled water

#### 2. Procedure

- a. Clean probe as in section 3.2.1 - either method

- b. Place the cell in the beaker and add sufficient YSI #3140 solution to cover the electrodes. Do not cover the top of the probe
- c. Plug the probe into the Model 33 and switch to the X100 scale to platinize the electrode
- d. Move the probe slightly to obtain the highest meter reading and continue platinizing for the appropriate time shown below:

<u>Meter Reading</u> (umhos/cm)	<u>Time</u> (minutes)
30,000	5
25,000	6
20,000	8
15,000	11
10,000	16

- e. After the elapsed time, remove the probe and rinse in distilled water.
- f. Return the solution to its container. Two ounces of solution should be sufficient for 50 treatments.

### 3.2.3 Storage

It is best to store conductivity cells in deionized water. Cells stored in water require less frequent platinization. Any cell that has been stored dry should be soaked in deionized water for 24 hours before use.

## CALIBRATION AND MAINTENANCE PROCEDURES HAAKEBUCHLER pH STICK

### 1.0 INTRODUCTION

This procedure presents the steps for calibrating and maintaining the HaakeBuchler pH Stick. Instrument operation principles and procedures and specifications are presented in Procedure 5617003.

### 2.0 CALIBRATION

#### 2.1 Calibration Solutions

The instrument requires distilled water, a pH 7 buffer solution, and a pH 4 buffer solution for calibration. To prepare the buffer solutions, dissolve the buffer powders provided with the instrument into the volume of distilled water specified on the buffer powder packets. (Note: the manufacturer does not specify whether buffer and pH 4 solutions, other than that provided, may be used as substitute solutions).

The pH of the buffer and pH 4 solutions will vary with the temperature of the solution. Use the table below to determine solution pH based on temperature.

Temp	0°C	10°C	20°C	25°C	30°C	40°C	50°C
pH 4	4.00	4.00	4.00	4.01	4.02	4.04	4.06
pH 7	7.11	7.06	7.01	7.00	6.98	6.97	6.97

#### 2.2 Calibration Procedure

The instrument requires calibration in the field prior to each use. However, as a check of proper instrument function, the instrument should be periodically calibrated in the laboratory.

particularly if the instrument has been stored for an extended period without use.

To calibrate the instrument:

1. Remove the protective sheath and rinse the electrode in distilled water.
2. Place the electrode in the pH 7 buffer solution, depress the white operation button below the LCD display and allow the reading to stabilize.
3. Adjust pH 7 control using the tool on the end of the protective sheath. The pH 7 control is the upper most white control on the right side of the instrument. Adjust the pH control until the meter reads pH 7.
4. Rinse the electrode in distilled water.
5. Place the electrode in pH 4 solution, depress the white operation button, and allow the reading to stabilize.
6. Adjust the slope control (white control below pH 7 control on the right side of the instrument) until the meter reads the correct value of the pH 4 solution.
7. Rinse the probe in distilled water.
8. Repeat steps 2 through 7.
9. Record calibration on the instrument log form.
10. Store instrument properly.

### 3.0 MAINTENANCE

#### 3.1 Storage

To maintain high accuracy and to obtain a long electrode life, the pH stick must be stored correctly when not in use. Always rinse the electrode in distilled water before replacing it in its protective sheath. The electrode must not be let to dry out.



The absorbent pad at the bottom of the sheath must be kept saturated with a pH 7 buffer solution. If this is not available, distilled water can be used as a temporary measure. Replace distilled water with buffer solution at the earliest possible opportunity. Always place buffer (or distilled water) into sheath following each use.

To retain accuracy and speed of response, the insulation of the connectors on the electrode and the body must be kept clean and dry. This is best assured by not unnecessarily removing the electrode from the body.

When not in use, place the pH stick in the wallet provided and store in a dry place.

### 3.2 Electrode Cleaning

If rinsing the electrode in distilled water is not deemed sufficient to clean the electrode, it can be cleaned in a N/10 HCl acid solution. Following cleaning in the acid, the electrode should be soaked in a pH 7 buffer solution for 24 hours before rinsing. Record cleaning on instrument's log form.

### 3.3 Battery

Normal battery life is in excess of 200 hours of continuous use. Cells should be replaced at 2 year intervals or earlier if exhausted (voltage per cell of less than 1.35V). Replacement cells must be mercury type V312H or direct equivalent. When refitting cells, make sure they are refitted in the manner illustrated on the battery housing.

## EQUIPMENT AND INSTRUMENT CALIBRATION AND MAINTENANCE, GENERAL REQUIREMENTS

### 1.0 INTRODUCTION

The general guidelines for calibrating and maintaining instruments and monitoring equipment are presented in this document.

### 2.0 CALIBRATION AND MAINTENANCE PROCEDURES

Calibration and maintenance procedures are documented for each piece of equipment affecting quality. Calibration and maintenance procedures are developed based on manufacturer's specifications and are retained in the Site Investigation Procedures Manual. These procedures include, but are not limited to:

1. Equipment identification (name) and description.
2. Equipment specifications.
3. Calibration and/or maintenance schedule.
4. Equipment necessary to accomplish calibration (where applicable).
5. Procedure for calibration and/or maintenance.

### 3.0 CALIBRATION LABEL

Instruments requiring calibration and/or maintenance have a prominently displayed sticker containing the following information:

1. Date of calibration and/or maintenance.
2. Next due date for calibration and/or maintenance.
3. Initials of person performing calibration and/or maintenance.
4. Span gas and concentration(s) (if applicable).
5. Span or sensitivity setting (if applicable).

#### 4.0 EQUIPMENT LOG BOOK

An equipment log book is issued to record the life history of each measuring and testing device used in activities affecting quality. This book is a three ring binder in which individual records for each piece of equipment are maintained. A form such as F6101 or a reasonable facsimile should be used to maintain the calibration and maintenance record. The record should include:

1. Equipment identification (name) and control number.
2. Date of calibration and/or maintenance.
3. Condition of equipment.
4. Activity performed on instrument (calibration and/or maintenance).
5. Adjustments made and accuracy of equipment prior to and following calibration (where applicable).
6. Record of equipment failure or inability to meet specifications (where applicable).
7. Initials of person performing calibration/maintenance.
8. Next due date for calibration and/or maintenance.

#### 5.0 CALIBRATION/MAINTENANCE FORM

An instrument specific calibration/maintenance form will be developed to record data relating to each individual calibration/maintenance event. A single form will be used for each calibration/maintenance event. In addition to the data recorded in the calibration/maintenance log, the following items should also be included in the instrument specific form (where applicable).

1. Calibration calculations and curves.
2. Span gas type and concentrations.
3. Span or sensitivity range settings.
4. Specifics on repairs and parts replaced, added, or removed.

5. Instrument's overall condition.

#### 6.0 FIELD CALIBRATION

As part of normal field operations, some instruments require calibration prior to, during, and/or after field use. This field operation calibration should remain separate from pre-field calibrations and should not be used as a substitute for standard calibration activities. Field calibration should be recorded in field log books or on field forms as part of the normal field data collection process. Field calibration records should not be included in the history log.

#### 7.0 INSTRUMENTS NOT IN COMPLIANCE

If the calibration schedule is not adequately maintained, or if accuracy as reported in specifications cannot be attained for a specific instrument, that instrument is labelled "HOLD" and is unavailable for use until it is repaired and specifications are attained.



**APPENDIX D**  
**IEPA SAMPLE BOTTLE SUPPLY SERVICE**

16813/55

US4102

Exhibit 4

SECTION 8

SAMPLE CONTAINER AND COMPONENT SPECIFICATIONS

US4103

## SAMPLE CONTAINER AND COMPONENT MATERIAL SPECIFICATIONS

Figure B-1 following, designates the specifications for the eight types of containers and the associated materials (i.e., teflon liners, lids, etc.) to be supplied by the Contractor under this contract.

All materials received from vendors shall be subjected to incoming inspection by the Contractor to insure conformance with these established specifications. Variations in materials shall be considered unacceptable. Any materials not in conformance with these specifications shall be returned by the Contractor to the vendor for replacement.



FIGURE B-1

Container Type	Container and Material Specification	Parameter and Sample Type
1	Container: 1 liter* amber, Boston round, glass bottle, 33 mm pour-out neck finish Closure: white polypropylene cap, 33-400 size, .015 mm teflon liner	Extractable Organics
3	Container: 1 liter* natural high-density polyethylene cylinder round bottle, 52g weight, 28 mm neck finish. Closure: baked polyethylene, white ribbed, 28-400 or 28-410 size; unlined lid.	Metals, Cyanide Radioactivity, General, Nutrients, Sulfide
5	Container: 32 oz. tall, wide-mouth straight-sided paragon, flint glass jar, 89 mm neck finish. Closure: white polypropylene cap, 89-400 size, .015 mm teflon liner	Extractable Organics, Oil/Grease, Metals, Mercury, Cyanide, Nutrients, Phenols, General, Sulfide
7	Container: 8 oz. wide-mouth glass jar	Same as type 5
8	Container: 40 ml borosilicate glass vial, Type 1 glass, 24 mm neck finish. Closure: black phenolic, open-top, screw cap, 15 cm opening, 24-400 size. Septum: 22 mm disc of 2 mil teflon bonded to silicon for total thickness of 125 mil.	THM/VOA
9	Container: 1/2 gallon amber glass, ring handle bottle/jug, 38 mm neck finish. Closure: teflon-lined white propylene cap, 38-400 size.	Extractable Organics

- |    |  |               |
|----|--|---------------|
| 10 | Container: 500 ml natural high density polyethylene, oblong bottle, 43 mm neck finish. Closure: white propylene unlined cap, 43-400 size (or 43 mm).   | Mercury       |
| 11 | 1 gallon plastic   | Prefiltration |
| 12 | Container: 2 oz., wide-mouth straight-sided paragon, flint glass jar, 53 mm neck closure: white polypropylene cap, 53-400 size, 0.015 mm teflon liner. | THM/VOA       |

\* These bottles must have sufficient overfill to accommodate an actual capacity of 1 liter of liquid. Bottle manufacturers refer to these bottles as 32 ounce bottles, however all 32 ounce bottles do not have sufficient overfill to meet the requirement.

NOTE: Containers and component material specifications different than, but equivalent to, the manufacturer's specifications cited herein may be acceptable. The bidder shall be required to demonstrate equivalence prior to Government approval of use of alternate materials. The Government shall determine acceptability as part of bidder preaward confirmations (see Pre-Award Bid Confirmations).

Exhibit A

SECTION C

CONTAINERS PREPARATION AND CLEANING PROCEDURES

US4107

CONTAINER PREPARATION AND CLEANING PROCEDURES

The Contractor shall clean and prepare containers and component materials according to the following procedures specified for each container type.

I. Extractable Organics

Container Types: 1 - 1 liter amber glass  
5 - 32 oz glass jar  
9 - 1/2 gallon amber glass  
7 - 8 oz glass jar

1. The containers, teflon liners and caps are to be washed in hot tap water with laboratory-grade non-phosphate detergent.
2. Rinse three times with tap water.
3. Rinse three times with ASTM Type I organic-free water.
4. Dry in oven @ 125°C for one hour.
5. Rinse inside and outside of container with pesticide hexane.
6. Dry containers, liners, and caps in an oven at 125°C for one hour.
7. Allow containers to cool and seal with teflon lined caps.
8. Label each container with color coded labels, with lot number, and pack in a sealable carton.
9. Place identical labels on exterior of carton and store in a designated contaminant-free area.

II. Purgeable Organics:

Container Types: 8 - 40 ml glass vial  
12 - 2 oz. glass jar

1. Containers, teflon-backed septa and caps are washed in hot tap water with laboratory-grade non-phosphate detergent.
2. Rinse three times with tap water.
3. Rinse three times with ASTM Type I organic-free water.
4. Oven dry vials, containers, caps, septa, and teflon-lined lids at 125°C for one hour.

5. Cool in a contaminant-free area.
6. Seal vials with septa (teflon side down) and cap. Seal containers with cap and liner.
7. Label each vial and container with color coded label with lot number, and pack in a carton and seal.
8. Place identical label on outside of carton with respective lot number and store in a contaminant-free area.

### III. Metals, Mercury, Cyanide, Radioactivity

Container Types: 3 - 1L high-density Polyethylene  
5 - 32 oz glass jar  
10 - 250 ml high-density Polyethylene  
7 - 8 oz glass jar

1. The bottles and caps are washed in tap water with laboratory grade non-phosphate detergent.
2. Rinse with 50% reagent grade HNO<sub>3</sub>.
3. Rinse three times with ASTM Type I deionized water.
4. Invert and dry in a contaminant-free area.
5. Cap each container, label with color coded label with lot number and place in a carton.
6. Label carton with the same lot number and store in a contaminant-free area.

### IV. Phenols, Nutrients, General, Pre-filtration, Sulfide

Container Types: 3 - 1L high-density Polyethylene  
5 - 32 oz glass jar  
11 - 1 gallon plastic  
7 - 8 oz glass jar

1. Wash containers in tap water with laboratory-grade non-phosphate detergent. Wash caps in a separate wash.
2. Rinse three times with tap water.
3. Rinse three times with ASTM Type I deionized water.
4. Invert bottles and dry in a contaminant-free area.

5. Cap bottles and label with color coded label with lot number and pack a carton.
6. Label the carton with the same lot number and store in a contaminant-free area.

7. Oil and Grease

Container Types: 5 - 32 oz glass jar  
7 - 8 oz glass jar

1. The containers, teflon liners, and caps are washed in hot tap water with laboratory-grade non-phosphate detergent.
2. Rinse three times with tap water.
3. Rinse with ASTM Type I deionized water.
4. Dry in oven at 105°C for one hour.
5. Allow containers to cool and seal with teflon lined caps.
6. Label each container with color coded labels with lot number and pack in a sealable carton.
7. Place identical labels on exterior of carton and store in a designated contaminant-free area.

**SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION  
OPERABLE UNIT SAMPLING AND ANALYSIS PROJECT PLAN**

**PREPARED FOR:**

**ILLINOIS ENVIRONMENTAL PROTECTION AGENCY  
DIVISION OF LAND POLLUTION CONTROL  
REMEDIAL PROJECT MANAGEMENT SECTION  
FEDERAL SITE MANAGEMENT UNIT  
2200 CHURCHILL ROAD  
SPRINGFIELD, ILLINOIS 62794-9276**

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## **SAMPLING AND ANALYSIS PLAN**

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## 1.0 INTRODUCTION

### 1.1 OBJECTIVES OF SAMPLING PROGRAM

This Sampling and Analysis Plan (SAP) describes the field activities required for the Operable Unit in the Southeast Rockford Groundwater Contamination Area. The objectives of the sampling program are as follows:

- o Determine the need for an alternate water supply in areas affected by the contaminant plume;
- o Obtain water quality data from residential and industrial wells in areas where gaps currently exist;
- o Evaluate current risks to public health resulting from the contaminated groundwater; and
- o Acquire information needed to assess feasible remedial actions.

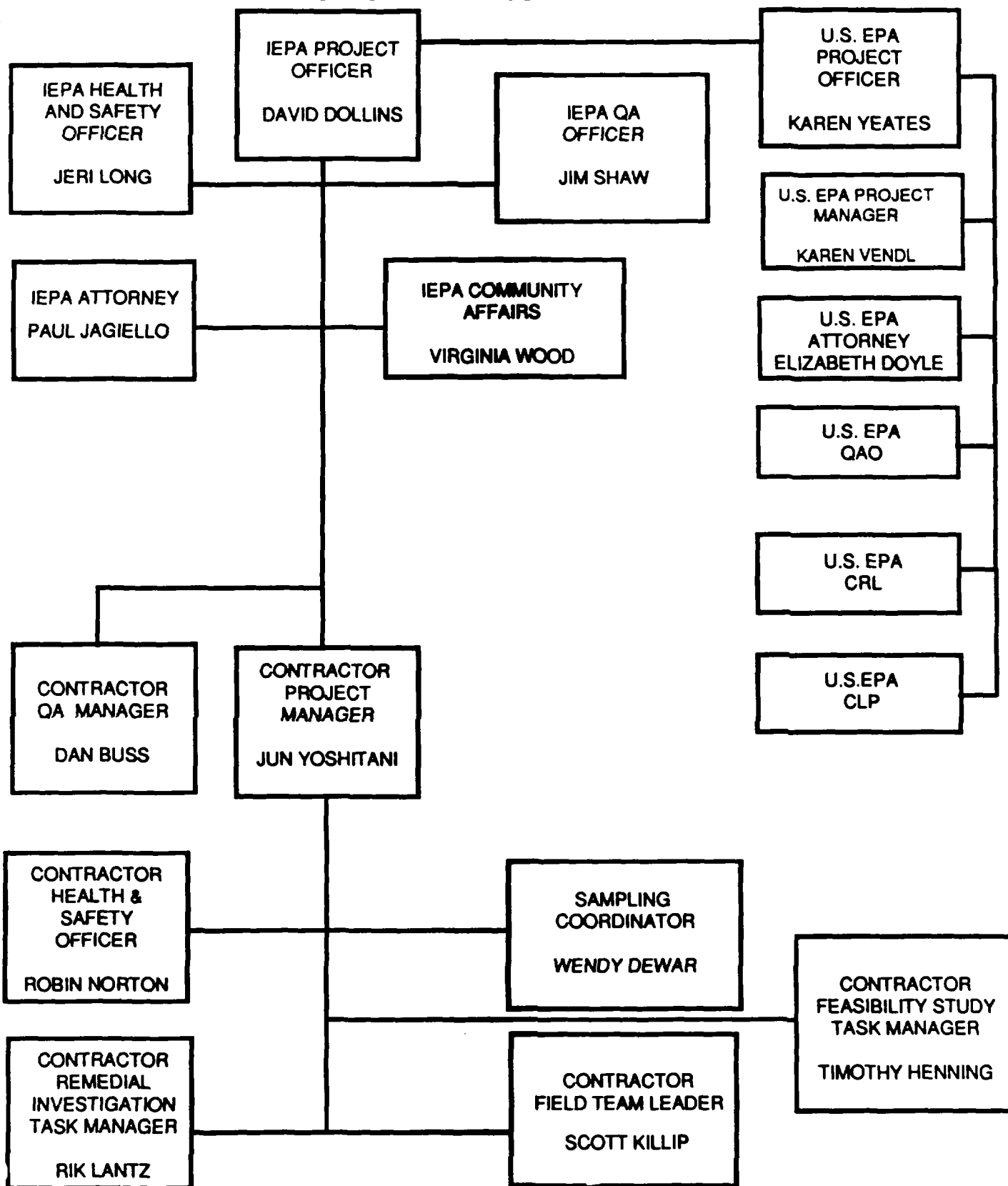
### 1.2 SAMPLING TEAM RESPONSIBILITIES

Field sampling will be performed by Camp Dresser & McKee (CDM). The Field Operations Organization is shown in Figure 1-1. Responsibilities of the sampling team are described below.

#### Field Manager

The Field Manager (FM) (in conjunction with the Site Manager), will be responsible for assigning responsibilities to members of the sampling team, as well as overseeing all field activities. The FM will coordinate mobilization and demobilization for the sampling team, as well as for any subcontractors. The FM will be responsible for keeping the Site Manager up to date on all sampling and subcontractor activities.

# FIGURE 1-1 SOUTHEAST ROCKFORD OPERABLE UNIT ORGANIZATION CHART



Sampling Team Leader

The Sampling Team Leader (STL) will be responsible for the sampling activities, will assure the availability and maintenance of all sampling equipment and materials, and will maintain an adequate supply of shipping and packing materials. The STL will supervise the completion of all chain-of-custody records, the proper handling and shipping of the samples collected, be responsible for the accurate completion of field log books, and provide close coordination with the Field Data Coordinator (FDC) and the Field Manager (FM). The STL or FM will be present whenever samples are collected.

Sampling Team Member(s)

The Sampling Team Member(s) (STM) will perform field measurements, collect samples, prepare samples for shipping, and decontaminate sampling equipment, as directed by the STL.

Field Data Coordinator

The Field Data Coordinator (FDC) will remain in the Support Area and will accept custody of samples from the sampling team. The FDC will be responsible for the completion of all chain-of-custody and sample traffic control forms. The FDC will also be responsible for maintaining communications with on-site personnel and off-site laboratory personnel, as well as for logging all communications and site entries and departures.

Site Health and Safety Coordinator (SHSC)

The SHSC is responsible for daily supervision and documentation of all safety, decontamination, environmental monitoring and field medical monitoring activities. The SHSC is also responsible for assuring that all field personnel comply with the provisions of the CDM Health and Safety

Assurance Manual and site Health and Safety Plan. The SHSC has the authority to suspend site work if conditions become unsafe, if HSAM/HSP requirements are not met, or if he/she determines that an upgraded level of protection may be required. The SHSC is responsible for designating and marking restricted areas during various site activities and for redesignating these areas when it is appropriate to do so.

#### Safety Technician

The Safety Technician (a designated member of the sampling team) will aid other Sampling Team Members with the donning and doffing of protective clothing, decontamination of sample containers and equipment, and will be available to replenish miscellaneous supplies, such as ice and vermiculate, as needed. The Safety Technician will report directly to the SHSC in health and safety related duties and will assume the responsibilities of the SHSC in the event of his/her absence from the site or in an emergency.

#### 1.3 SCOPE OF SAMPLING ACTIVITIES

The scope of sampling activities covered by this plan include the collection and analysis of 189 samples: 155 of these samples are investigative, 17 are field duplicates, 15 are trip blanks and 17 are field blanks. Samples will be collected from residential, municipal and industrial wells. The sampling and analysis program, including specific parameters which will be analyzed and quantity of quality control samples, is summarized in Table 1-1.

Samples will be collected over a period of two weeks.

TABLE 1-1  
SUMMARY OF SAMPLING AND ANALYSIS PROGRAM

Sample Matrix	Field Parameters	Laboratory Parameters	QA Samples									Matrix Total
			Investigative Samples			Field Duplicate			Field Blank			
			No.	Freq	Total	No.	Freq	Total	No.	Freq	Total	
Residential Wells	pH, Specific Conductance, Temperature	SAS for volatile organics from CLP <sup>1</sup>	144	1	144	15	1	15	15	1	15	174
		SAS for metals from CLP <sup>2</sup>	144	1	144	15	1	15	15	1	15	174
Municipal Supply Well	pH, Specific Conductance, Temperature	SAS for volatile organics from CLP <sup>1</sup>	1	1	1	1	1	1	1	1	1	3
		SAS for metals from CLP <sup>2</sup>	1	1	1	1	1	1	1	1	1	3
Industrial Wells	pH, Specific Conductance, Temperature	SAS for volatile organics from CLP <sup>1</sup>	10	1	10	1	1	1	1	1	1	12
		SAS for metals from CLP <sup>2</sup>	10	1	10	1	1	1	1	1	1	12

\* A trip blank will be included with each shipment of volatile organic samples. An estimated 15 trip blanks will be required.

\*\* One sample out of every 20 (or portion thereof) will be collected as a matrix spike duplicate sample.

<sup>1</sup> CLP SAS volatile parameters are listed in Table 5-1 of the QAPP.

<sup>2</sup> CLP SAS metal parameters are listed in Table 5-2 of the QAPP.

## 2.0 SAMPLE LOCATIONS AND RATIONALE

Because IDPH has sampled the Southeast Rockford area extensively since 1984, as discussed in the Work Plan, the IDPH data set was considered along with the TAT data set, in determining the current concentrations of contaminants across the study area. Movement of contaminant plumes throughout the subsurface can cause concentrations to vary with time, as measured at a single location, such as a private well. In order to minimize any potential effects related to temporal variations in contaminant concentrations, only data from 1988 to the present was considered in this study. The existing data in conjunction with the information provided by the IEPA well survey was used to design the sampling network described below. Figure 2-1 shows the current contaminant plume as defined by the existing data.

### 2.1 RESIDENTIAL WELL SAMPLING

CDM proposes to collect 144 investigative samples (not including QA/QC samples) from residential wells in the study area to complement the USEPA/TAT and IDPH data and to more accurately define those residences affected by groundwater contamination. The principal objective of the sampling during the Operable Unit is to identify residential wells in the study area that 1) are contaminated at levels between the MCLs and the method detection limits for the contaminants of concern; 2) are not currently served by municipal water; and 3) will not be served by the extended watermain to be installed by the USEPA. An additional objective of sampling is to maximize data coverage by avoiding resampling of residences that have been previously sampled. Therefore, the proposed sampling locations are concentrated outside of the known plume area (areas that were not sampled during previous studies or areas where previous sampling indicates variable contaminant concentrations). However, a small amount of resampling of residences previously sampled by IDPH is proposed

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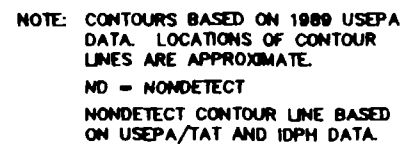


FIGURE NO.  
2-1

(approximately 7 percent of the number of investigative samples) to assess plume movement, seasonal effects, and to verify comparability of data from the current study with data from previous studies.

IEPA has conducted a residential well survey to identify residents in the study area that may use private wells to obtain potable water. The survey was conducted by directly sending questionnaires to residents that may be affected by the groundwater contamination. The survey coverage is not complete; areas south of Sawyer Road were not contacted, and no response to the survey was obtained for about 25 percent of the residences in the area covered by the survey. The area south of Sawyer Road is currently being addressed by IEPA by the ongoing residential well survey. The existing survey data is the most current and applicable data regarding existence of private water supply wells in the area, therefore the survey results were the primary resource used to determine proposed sample locations for the IEPA Operable Unit. The survey results as of April 4, 1990 were used to determine the sample locations.

In areas where the IEPA residential well survey did not provide information on the use of private wells, city of Rockford billing records supplied by Virginia Wood of IEPA were used to determine private well use. Because of known inaccuracies in the billing records, some sample locations in the area south of Sawyer Road were selected in areas where the billing records indicate that there may be no private wells, in order to achieve adequate sample coverage. In those areas, locations of private wells will be identified by the residential well survey currently being conducted by IEPA. Existence of private wells will be confirmed in the field prior to collecting samples.

A third source of information used in selecting sample locations was previous sampling events by IDPH and USEPA/TAT. Residences that have been sampled by USEPA were identified from chain-of-custody records and residences sampled by IDPH were identified from a database listing provided



by Clay Simonson of IDPH. Residences that have been sampled since 1988 were avoided in the proposed sample locations. However, in order to assess data comparability and potential plume migration, an overlap of approximately 7 percent was allowed between residences previously sampled by IDPH and proposed sample locations.

Finally, the area within the plume as defined by the existing data, areas to be served by the USEPA Removal Action proposed water main, and residences previously sampled by USEPA have been excluded from the proposed sample locations. The area to be addressed by the Removal Action has been determined based on a map provided by USEPA.

Using these sources of information, a list of proposed sample locations was developed, which is included as Table 2-1. A map of proposed and existing sample locations is included as Plate A attached to the back cover of this document. Because of the inaccuracies inherent in the database regarding locations of private wells in the study area, these sampling locations should be considered tentative, and may be modified in the field depending on access, the presence of private wells, and other factors. Any remaining data gaps or inaccuracies in the proposed sampling locations will be addressed in the field by a door-to-door survey. Alternate sample locations will be chosen as close to original locations as possible.

In order to achieve sample coverage in a cost-effective manner within the areas to be sampled, a total of 144 investigative sample locations are proposed, which will define the horizontal extent of groundwater contamination within a lateral resolution of one block or better. Because the depths of the screened intervals for private wells at the proposed sample locations are not known, it is not anticipated that the proposed samples will define vertical extent of groundwater contamination. This information will be requested during sampling, but it is doubtful that local residences will have this information.

**Table 2-1: SE Rockford Operable Unit  
Proposed Sample Locations**

<i>Street</i>	<i>Address</i>	<i>Street</i>	<i>Address</i>	<i>Street</i>	<i>Address</i>
4th	2805	11th	3015	Brooke	106
4th	2820	11th	3119	Brooke	202
4th	2917	11th	3208	Brooke	326
4th	3011	11th	3215	Brooke	411
4th	3045	11th	3301	Brooke	430
5th	2604	11th	3329	Brooke	613
7th	3115	15th	3135	Brooke	823
7th	3221	16th	3102	Brooke	914
7th	3305	16th	3122	Brooke	1101
7th	3337	17th	2602	Brooke	1202
8th	2914	17th	3120	Brooke	1317
8th	3009	17th	3141	Collins	2801
8th	3109	18th	3110	Collins	2825
8th	3138	19th	2622	Collins	3029
8th	3201	20th	2703	Collins	3109
8th	3237	20th	2717	Collins	3126
8th	3301	20th	3109	Collins	3245
8th	3337	Barnum	305	Collins	3310
9th	2624	Barnum	409	Fitch	407
9th	2730	Barnum	505	Fitch	507
9th	2808	Barnum	611	Fitch	601
9th	2842	Barnum	825	Fitch	807
9th	2927	Bildahl	3009	Grant	3045
9th	3102	Bildahl	3017	Grant	3107
9th	3210	Bildahl	3038	Hamilton	1735
9th	3245	Bildahl	3122	Harrison	733
10th	2627	Bildahl	3141	Harrison	1001
10th	3110	Bildahl	3206	Harrison	1713
11th	2613	Bildahl	3302	Harrison	1817
11th	2955	Bildahl	3338	Harrison	2315

**Table 2-1: SE Rockford Operable Unit  
Proposed Sample Locations**

<i>Street</i>	<i>Address</i>	<i>Street</i>	<i>Address</i>
Johnson	1737	Ranger	801
Kennon	315	River Blvd.	3007
Kennon	415	River Blvd.	3117
Kennon	517	River Blvd.	3125
Kennon	621	Rock Riv. Ave	508
Kishwaukee	3037	Roosevelt	843
Kishwaukee	3112	Sandy Hollow	728
Kishwaukee	3302	Sandy Hollow	826
Kishwaukee	3336	Sandy Hollow	1202
Lapey	3013	Sandy Hollow	1306
Lapey	3038	Sandy Hollow	1820
Lapey	3137	Saner	2905
Lapey	3213	Saner	3011
Lapey	3230	Saner	3110
Lapey	3325	Sawyer	319
Lindale	2406	Sawyer	407
Lindale	2620	Sawyer	525
Lindberg	2412	Sawyer	615
Lindberg	2619	Sewell	2622
Lyrar	1616	Sewell	2646
Lyrar	1701	Sewell	3137
Marshall	3125	South	527
Marshall	3137	South	619
Martin	430	Taft	801
Martin	508		
Martin	618		
Mattis	827		
Olsen	2812		
Pershing	1637		
Pershing	1726		

In the area west of 8th Street proposed sample locations were selected with a sample density of one sample per block. Because the residential well survey has not yet been completed, some proposed sample locations were chosen at residences where existence of a private well has not yet been confirmed. Consequently, it may be necessary to adjust these sample locations in the field. In this event, the target sample density of one sample per block will be maintained if possible. There is very little existing data in this area, therefore it is felt that a distribution of one sample per block is necessary to define the plume. This distribution also assumes that if water mains are installed in this area as part of the Operable Unit they will extend the entire length of the block because it will not be possible to determine any mid-block cutoffs with one sampling point per block.

In the area east of 8th Street, proposed sample locations were chosen by CDM in conjunction with IEPA and USEPA. For the purposes of this investigation, it has been assumed that existing USEPA/TAT and IDPH data adequately define the plume of VOC-contaminated groundwater at TCE concentrations greater than or equal to the MCL (5 ppb). All proposed sample locations have therefore been selected outside the 5 ppb TCE contour (Figure 2-1). The TCE plume was chosen to represent the extent of groundwater contamination by VOCs because the area represented by the plume of groundwater contaminated at levels exceeding the MCL for TCE encompasses all areas exceeding the MCL for the other VOCs detected at the site.

In those areas outside of the plume east of 8th Street, sample locations were selected based on existence of data gaps, presence of private wells, and previous sampling episodes. Within the constraints of these parameters, a sampling density of 1 to 2 samples per block was established as a goal, with the greater sample density concentrated near the margins of the plume. In this area it may be possible to have better lateral definition of the affected blocks by using a combination of existing and new data. This will be dependent on the degree of data comparability between the sampling events.

Figure 2-1 also shows the approximate contour line for homes with TCE values below detection limits based on existing IDPH and USEPA/TAT data. This line should be considered approximate because the data collection dates extend over two years (1988 and 1989) and the detection limits and analytical methods used have not been defined. The area east of 11th Street has been more extensively sampled than that area between 8th and 11th Streets. Therefore, a distribution of approximately one residence per block east of 11th Street and a distribution of two residences per block between 11th and 8th Streets were chosen based on the distribution of existing data. Sample locations have been selected both inside and outside the non-detect contour line. The sampling in areas outside the non-detect contour line is warranted in order to assess the extent of the metals contamination and in order to assess the cumulative health risks associated with the target volatile compounds (including TCE) that may be present at levels below the detection limits of the existing data.

## 2.2 INDUSTRIAL WELL SAMPLING

A review of aerial photographs indicates that there are approximately 26 sizeable industrial operations in the study area. Based on results of the response to the IEPA well survey, CDM will determine whether any of these industries are using groundwater as a potable water source. Only those industries using private wells for potable water will be sampled. It is anticipated that groundwater samples will be collected from a maximum of 10 industrial locations. Selection of industries to be sampled will be based on location with respect to the contaminant plume and accessibility of sampling, in addition to the requirement that the groundwater is used for potable water.

## 2.3 MUNICIPAL SUPPLY WELL SAMPLING

In addition to sampling residential and industrial wells, a sample from Municipal Supply Well 35, located at 2944 Bildahl, will be collected. This sampling will be conducted to provide information for subsequent FS tasks.

### 3.0 SAMPLING PROCEDURES

#### 3.1 SAMPLE COLLECTION

The sampling procedure for residential, industrial and municipal wells for metals and VOC analysis is briefly summarized as follows:

- o The closest accessible sampling point to the well (sink faucet, influent valve for water softener, etc.) will be fully opened and allowed to purge until a stable water temperature is attained. This will be determined by direct measurement of the flowing water with an electronic thermometer on one-minute intervals. Once the flowing water has stabilized to  $\pm 0.5^{\circ}\text{C}$  for three consecutive measurements, the water temperature will be considered stable and sampling will commence.
- o Every attempt will be made to sample a point of influent closest to the well in order to bypass any carbon filtration, water softening system, or any other influent purifying or filtration system. In the event that an influent sampling point cannot be located before the influent is treated by a water purifying system, the point of sampling and the type of purification system(s) will be documented in the field notebook.
- o Because these samples will be collected from sample points prior to any treatment (such as chlorination) it will not be necessary to test for the presence of chlorine in the samples.
- o pH, specific conductivity and temperature will be measured and recorded in accordance with procedures described in Appendix A to this Sampling Plan. A flow rate of approximately 100 ml/minute (as measured with a graduated cylinder and a portable timepiece)

will be attained and an appropriate number of decontaminated 40-ml VOA bottles will then be slowly filled, leaving no headspace (air bubbles) in the sample bottle. Care will be taken during filling the sample bottles to avoid agitation of the water. No chemical preservatives will be added to VOA samples.

- o After filling the sample bottle, the cap will be securely tightened and the bottle will be inverted and tapped firmly on the heel of the hand. If bubbles are visible, the bottle will be emptied and a new sample will be collected.
- o Following sample collection for VOC analysis, the water flow from the tap will be increased to a nominal rate and a one-liter polyethylene sample bottle will be filled with tap water to a level equal to the shoulder of the sample bottle.
- o Nitric acid ( $\text{HNO}_3$ ) will be added as a preservative to the sampled water in the amount necessary to reduce the pH of the water to <2. The pH of the sample will be tested with litmus paper on all samples collected for metals analysis.
- o The filled sample bottles will be decontaminated by rinsing with deionized water.
- o The sample bottles will be sealed in a zip-lock bag and immediately placed in an iced cooler.
- o Surgical gloves will be worn by the sampler while collecting the sample to avoid cross-contamination.

If the industrial or municipal wells have been pumping within the last 6 hours they will be purged using the same procedure as for the residential wells. If a well has been inactive for more than 6 hours, the effort will

be made to pump the well until the system piping has been purged. An estimate of system volume will be made and temperature will be used to determine stabilization as previously described. Once the system is purged/stabilized, the sample will be collected using the previously described procedure. As with residential sampling, all efforts will be made to collect a sample prior to any treatment or filtration.

Further details of sampling procedures for the collection of water samples from residential water supplies are described in Appendix B to this Sampling Plan.

### 3.2 SAMPLE CONTAINERS AND PRESERVATION

Four 40-ml glass VOA bottles for VOC analysis and one 1-liter polyethylene sample bottle for total metals analysis will be collected at each sample location, in accordance with the October 27, 1989 USEPA Region V Sample Handling Manual. Sample bottles and vials will be supplied by the IEPA Sample Bottle Repository. Samples will be analyzed by a laboratory certified by the Contract Laboratory Program (CLP). At sample sites where duplicate samples will be collected, double sample volume (eight 40-ml glass vials and two 1-liter polyethylene bottles) will be supplied to the lab for analysis. At sample sites where matrix spike/matrix spike duplicates (MS/MSD) are collected, eight 40-ml glass vials will be supplied to the lab for analysis. No additional sample volume of water for metals analysis will be required or supplied to the lab for MS/MSD analysis. Samples for VOC analysis will not be preserved with HCL but will be chilled in an iced cooler to a temperature of 4°C. Samples for metals analysis will be preserved with nitric acid to a pH<2 (approximately 5 ml 1:1 nitric acid per bottle) and will not require cooling.

Sample collection, containerization and preservation will be performed in accordance with procedures in the USEPA Sample Handling Manual, contained in Appendix C to this Sampling Plan.



### 3.3 SAMPLE HOLDING TIMES

The respective sample holding time for drinking water analysis for volatile organics and total metals is 7 days and 6 months from sample collection to analysis. To expedite sample analysis, the samples will be shipped to the laboratory via an overnight carrier (i.e., Federal Express) on the day the samples are collected.

### 3.4 SAMPLE PACKAGING AND SHIPMENT

Following sampling, the sample bottle exteriors will be decontaminated near the sampling location, or rinsed with potable or distilled water prior to shipment. The Field Manager will help the Field Data Coordinator prepare documentation and package the bottles for shipment according to the following procedures:

- o Ensure that the sample is properly preserved; tighten cap securely.
- o Place containers in a cooler lined with two inches of vermiculite or equivalent absorbent material and maintain at 4°C with cold packs, or ice sealed in plastic bags (for VOC samples); fill remaining space in cooler with additional packing material.
- o Put chain-of-custody forms and traffic reports in a zip-loc bag and tape to inside of cooler lid.
- o Close cooler and seal with strapping tape; if cooler has a drain port, seal it with tape; place one custody seal across closure at front of cooler and across hinge area at back of cooler, or rear side corner.
- o Affix airbill with shipper's and cosignee's addresses to top of cooler; if samples are liquid, place "This End Up" labels appropriately.

The Field Manager will contact the Sampling Coordinator to confirm sample shipment dates two weeks in advance for Special Analytical Service (SAS) analyses to CLP. The Field Manager will notify the Sampling Coordinator of any last minute changes in the sampling schedule.

Upon shipment of samples to the Laboratory, the Field Data Coordinator will call the Sampling Coordinator (before 5:30 p.m. Central Standard Time on the day of shipment, or early the following morning). The Sampling Coordinator must be notified by 2:00 p.m. on Friday for shipments to the CLP for Saturday delivery/pick-up. The Sampling Coordinator will be provided with the following information:

1. Case and/or SAS numbers (if applicable);
2. Name of laboratory(ies);
3. Date of shipment;
4. Carrier, airbill number;
5. Number and matrices of samples shipped; and
6. Information regarding changes and delays pertaining to the activity.

The Sample Identification Record form will be used to record this information. A copy must be sent to the Sampling Coordinator with the other sample documents, which include copies of the CRL Basic Data forms or SAS Packing List, and Chain-of-Custody forms.

The Central Regional Laboratory Sample Data Report form for samples being sent to the CLP must also be sent to the Sampling Coordinator. These forms are not sent to the CLP.

### 3.5 CHAIN-OF-CUSTODY PROCEDURES

Chain-of-custody will be maintained throughout the sample preparation procedure as described in the Quality Assurance Project Plan (QAPP), Section 7.0.

- o All information required on the custody tag, including the signatures of the sampling team leader and a predesignated location description, will be filled out in the field.
- o Prior to relinquishing samples for packaging and shipment, one member of the sampling team will transfer all data contained on the custody tags to a chain-of-custody record, which the team leader must sign.
- o The individual who prepared the chain-of-custody record will relinquish the samples to the sample handling technician, who will prepare all CLP traffic reports and affix appropriate traffic report labels to the sample containers.
- o The technician will package the samples for shipment ensuring that all traffic reports, chain-of-custody records and custody seals are cross-referenced and recorded on the Sample Identification Record Form and that all sample documentation paper work is enclosed.
- o If VOC samples are stored temporarily, prior to shipment, they will be kept cool (4°C) and placed in a secured storage area. Coolers will be sealed and custody seals affixed just prior to shipment.

### 3.6 DOCUMENTATION

This section outlines the documentation required for all field activities and sample shipment to be conducted during the Operable Unit Field Activities.

#### 3.6.1 FIELD LOG BOOKS

Field log books will provide the means of recording data collected during the performance of RI activities. As such, entries will be described in as

much detail as possible so that site personnel can reconstruct a particular situation without sole reliance on memory.

Field log books will be bound, field survey books. Log books will be assigned to field personnel, and stored in the document control center when not in use. Each log book will be identified by the project-specific document number.

The title page of each notebook will contain:

- o Person or Organization to whom the book is assigned;
- o Book Number;
- o Project Name;
- o Start Date; and
- o End Date.

Entries into the log book will contain a variety of information. At the beginning of each entry, the date, start time, weather, name of all team members present, level of personal protection being used, and the signature of the person making the entry will be recorded. The names of visitors to the site, field sampling or investigation team personnel and the purpose of their visit will be recorded in the field log book. At the end of each day's activity, the log will be closed with the time and signature of the person making the last entry (log-closed line). The log-closed lines and the following log-open lines will be placed so that no unauthorized entries can be made in-between. A typical format is presented in Figure 3-1.

Measurements made and samples collected will be recorded. All entries will be made in ink and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark.

Wherever a sample is collected or a measurement is made, a detailed description of the location of the station, which may include compass and

**FIGURE 3-1**

### TYPICAL FIELD NOTEBOOK ENTRY FORMAT

LOG-OPEN TIME: \_\_\_\_\_ DATE: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

WEATHER: \_\_\_\_\_

FIELD PERSONNEL:

LEVEL OF PERSONAL PROTECTION:

EQUIPMENT (NAME/CONTROL NO.): Calibration Date:

Station No./Location Description: \_\_\_\_\_

Film Roll Number: Photograph Numbers:

Station No.	(Parameter (Units)
-------------	--------------------

Sampling Equipment:

[illegible]

distance measurements, shall be recorded. The number of the photographs taken of the station with a brief description and the direction faced will also be noted. All equipment used to make measurements will be identified, along with the date of calibration.

Samples will be collected according to the procedures documented in the SAP. The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth at which the sample was collected, volume and number of sample containers. Sample location identifiers will be assigned prior to sample collection. Duplicates, which will receive a separate CRL sample number, will be noted under Sample Description.

### 3.6.2 SAMPLE IDENTIFICATION SYSTEM

#### U.S. EPA CRL SAMPLE NUMBER

Each sample will be assigned a U.S. EPA CRL sample number, regardless of the laboratory to which it is sent. The CRL sample number will consist of nine alphanumeric characters, as follows:

90RS01xyy

The first six characters (90RS01) will remain constant for RI sampling.

90 Fiscal year 1990  
R Indicates samples sent by CDM  
S Designates project manager  
01 Designates survey number

The last three characters will vary during the sampling survey. The character "x" is a single digit alpha code designating the type of sample:

- S Sample
- D Duplicate sample
- R Blank sample

The character "yy" is a 2-digit (01 through 99) number designating the sample number. After 99 samples have been collected for the survey, the survey number (characters 5 and 6) is changed. For S-type samples, "yy" is used to consecutively number samples taken during this survey. For duplicate (D-type) samples, "yy" is the same as the sample number of which it is a duplicate. For blank (R-type) samples, "yy" is the consecutive number of blank samples taken during this survey.

EXAMPLE U.S. EPA CRL SAMPLE NUMBERS

- o 90RS01S01, 90RS01S02, 90RS01S03  
Samples No. 01, 02, and 03 of Clark's Survey No. 1.
- o 90RS01D02  
Duplicate sample of Sample No. S02.
- o 90RS01R01, 90RS01R02  
Blank sample No. 01 and 02.

The sample identification number(s) will be recorded in the field log book and on all other paperwork and labels and will be cross-referenced to chain-of custody and pertinent shipping documents. A description of the sample location will be entered into the field log book, including compass directions and distances from reference points, if applicable.

#### SAMPLE LOCATION IDENTIFICATION

For this project, samples will be collected from residential, industrial and municipal wells for the purpose of determining if the water exceeds drinking water standards. Each sample will be identified by the property address where the well is located. All sample location addresses will be recorded in the field notebook. The Sample Identification Record Form (Figure 3-2) will also be used for computer tracking and identification of each sample. All proposed sample locations and associated address identifiers are shown on Table 2-1.

The sample CRL number and traffic report or SAS number will be cross-referenced to the address location of the sample as recorded in the field book. Sample duplicates and matrix spike/matrix spike duplicates will be marked on the USEPA CRL sample documentation as described previously in this section.

#### 3.6.3 SAMPLE DOCUMENTATION FORMS

Sample documentation required by the U.S. EPA are numbered and will be accounted for. If a document is voided, it should always be saved and returned it to the Sample Coordinator. Copies of the multiple-copy forms must accompany samples to the laboratory. The other copies must be sent to the Sampling Coordinator immediately following sampling shipment.

##### A) Chain-of-Custody Form

- 1) One form per shipping container (cooler) will be used.
- 2) Carrier service does not need to sign form if custody seals remain intact.
- 3) Will be used for all samples.



**FIGURE 3-2**

# SAMPLE IDENTIFICATION RECORD FORM

SITE NAME \_\_\_\_\_

SITE NUMBER \_\_\_\_\_

[illegible]

**WHEN FILLING OUT SAMPLE IDENTIFICATION RECORD FORMS:**

- 1) ONLY ONE CASE NUMBER PER SAMPLE ID RECORD FORM
- 2) LIST TRAFFIC REPORT (SMO) NUMBERS IN NUMERICAL ORDER  
(DO NOT LIST ACCORDING TO CRI NUMBERS)

**USA137**

B) Chain-of-Custody Seals

- 1) Two seals per shipping container will be used to secure the lid and provide evidence that samples have not been tampered with.
- 2) Seals will be covered with clear tape.
- 3) Seal numbers will be record numbers on Chain-of-Custody Form.
- 4) Seals will be used for all samples.

C) Special Analytical Service Packing List

- 1) Up to twenty samples can be listed per form.
- 2) Will be used only for samples sent to CLP for SAS analysis.
- 3) Samples are numbered using the SAS number assigned by CLP followed by a hyphen and progressive numerical designations, beginning with 1 (e.g. 2000E-1, 2000E-2, 2000E-3, etc.)
- 4) If sampling extends over several days and more than one PL is used, care must be taken to not repeat sample numbers.
- 5) Sampler will include bottom 2 copies of form with sample shipment; top copy will be returned to SMO and the second copy will serve as the sampler's file copy.

D) Sample Tags

- 1) Each sample container will have a Sample Tag affixed to it with string or wire.

- 2) Traffic Report number and Case Number will be recorded in the "Remarks" section of the tag.
- 3) Sample Tag Numbers will be recorded on the Chain-of-Custody Forms.
- 4) Will be used for all samples.

E) CRL Sample Data Report

- 1) Will be completed for all CLP samples.
- 2) For samples sent to CLP Laboratories, these forms will be sent to Sampling Coordinator to be forwarded to the RSCC.
- 3) The forms will be necessary for the U.S. EPA to track the samples and ensure data validation.

F) Sample Identification Record Form

- 1) Will provide a means of recording crucial sample shipping and tracking information.
- 2) This form will be maintained for each sample shipment and forwarded to Sampling Coordinator upon sample shipment.

All paperwork accompanying the samples being shipped to the CLP laboratories will be sealed in a plastic bag that is taped to the inside of the cooler lid. Copies of the chain-of-custody forms, and other paperwork (if possible) will be retained for the field files.

The sample handling technician will maintain lists cross-referencing site sample numbers, custody tag number, SAS numbers, analyses to be performed, custody seal number, shippers' airbill numbers, and consigned laboratories,

in a bound log book using black ink and on the Sample Identification Record Forms. For more details on sampling paperwork, refer to the "User's Guide to the Contract Laboratory Program", USEPA, Washington D.C., December 1986 and the excerpt from the USEPA Sample Handling Manual in Appendix C.

#### 4.0 DECONTAMINATION PROCEDURES

Procedures to be followed to decontaminate equipment and personnel will be fully described in the SE Rockford Health and Safety Plan. The procedures are summarized below.

##### 4.1 PERSONNEL DECONTAMINATION

Since sampling will be of drinking water samples, no work zones are anticipated. All necessary decontamination procedures will be conducted in accordance with the protocols set forth in the Site Health and Safety Plan.

##### 4.2 EQUIPMENT DECONTAMINATION

Since sampling will be of drinking water samples, no equipment decontamination is anticipated.

##### 4.3 SAMPLE BOTTLE DECONTAMINATION

Sample bottles for shipment to the laboratories will be decontaminated by rinsing the exterior with potable or distilled water. Solvents will not be used to wash sample bottles.

##### 4.4 STORAGE AND DISPOSAL OF RI GENERATED WASTES

The sampling activities are not expected to generate solid and liquid "waste".

## 5.0 FIELD QUALITY CONTROL PROCEDURES

To ensure the level of data quality required for Superfund Remedial Investigations, the following Quality Control (QC) procedures will be performed. QC sample requirements are summarized in Table 5-1.

### Field Duplicates

One duplicate sample will be collected for every 10 samples (or portion thereof) collected in the field. Duplicate samples will be collected at the same sample volume and in the same type of container as the other samples.

### Field Blanks

One field blank water sample will be prepared for every ten samples collected. Field blanks will be prepared by filling water sample bottles with reagent grade distilled water to the same volume as the drinking water samples. Sample bottles for all parameters will be prepared. These samples will be prepared in close proximity to an actual sample location. This location will be recorded in the sample field book log.

### Trip Blanks

A trip blank for volatile organic analysis (VOA) will be included in each sample shipment for volatile organic analysis. The trip blank will consist of 3 40-ml VOA vials filled with reagent grade distilled water. The trip blank shall be prepared in the office or laboratory, transported to the field, and shipped with the other samples to the CRL or CLP without being opened. The trip blank will be documented on a SAS report form for a shipment being sent to the Contract Laboratory Program. The trip blank

will be documented on the chain-of-custody form and on the CRL Data Form for a shipment being sent to the CRL.

Matrix Spike and Matrix Spike Duplicates (MS/MSD)

One sample out of every 20 (or portion thereof) will be collected for MS/MSD analysis. Eight 40-ml VOA vials of water will be collected for each matrix spike sample, as specified in the USEPA Region V Sample Handling Manual. No additional sample volume will be required or supplied to the lab for MS/MSD metals analysis. The matrix spike sample will be denoted by the sample number followed by an -MSD suffix on sample tags, chain-of-custody forms, and other appropriate sample paperwork.

**Table 5-1: Summary of QC Sample Requirements**

<b>Sample Type</b>	<b>Sample Volume</b>	<b>Frequency</b>	<b>No. of Samples</b>
<b>Residential Well</b>	4-40 ml VOA vials 1-1 liter poly bottle	N/A	144
<b>Industrial Wells</b>	4-40 ml VOA vials 1-1 liter poly bottle	N/A	10*
<b>Municipal Well</b>	4-40 ml VOA vials 1-1 liter poly bottle	N/A	1
<b>Duplicate</b>	4-40 ml VOA vials 1-1 liter poly bottle	1:10	17
<b>Field Blank</b>	4-40 ml VOA vials 1-1 liter poly bottle	1:10	17
<b>Matrix Spike Duplicate</b>	8-40 ml VOA vials	1:20	10
<b>Trip Blank</b>	4-40 ml VOA vials	1 per shipment	15*

\* Approximate



**APPENDIX A**

**PROCEDURES FOR MEASUREMENTS OF pH, SPECIFIC CONDUCTANCE,  
AND TEMPERATURE OF WATER SAMPLES**

## Field Measurement of pH in Water

### 1. Scope and Application

This method is applicable to samples of surface water and groundwater with measurement occurring at the sampling location.

### 2. Summary of Method

The pH of water is determined using a portable, field pH meter with a temperature-compensated combination electrode.

### 3. Apparatus

- A) Haake Buchler pH Meter Stick
- B) 100 ml disposable beakers

### 4. Reagents

- A) pH reference buffer solutions:

- 1) pH = 4.00  $\pm 0.01$
- 2) pH = 7.00  $\pm 0.01$
- 3) pH = 10.00  $\pm 0.01$

- B) distilled water

### 5. Sample Handling and Preparation

Sample aliquots for pH measurement should be obtained directly from the sampling point in 100 ml disposable beakers.

### 6. Calibration

Calibrate the meter/electrode using two reference solutions that bracket the expected pH of the sample. Reference solutions should be at room temperature. Immerse the electrode in pH 7.00 solution and adjust the meter as needed. Remove and rinse the electrode and repeat using the second buffer solution. Repeat adjustments until readings are within 0.05 pH units of the reference values. For additional information see SIPM Method 6617003.

7. Procedure

Immerse the electrode in the water while gently agitating. After about one-half minute, record the pH reading to the nearest 0.05 units -- provided the meter readings are not fluctuating more than  $\pm 0.03$  units. Be sure that temperature compensation has been provided for. Remove and thoroughly rinse the electrode with distilled water. Repeat the measurement procedure until four readings have been obtained. For additional information see SIMP Method 5617003.

8. Interferences

Prolonged immersion of the electrode in turbid solutions can lead to plugging of the liquid junction and erratic meter readings. The electrode should be cleaned by gently blotting with a lab tissue and rinsing with distilled water.

9. Verification of Accuracy

Following the last of the four replicate measurements, immerse the rinsed electrode in each of the reference buffer solutions used to calibrate the meter/electrode prior to sample measurements. If the readings are not within 0.05 units of the reference values, recalibrate the meter/electrode and re-do the measurement of the sample just tested.

10. Assessment of Precision

Calculate the mean and standard deviation of the four replicate measurements. If the standard deviation is greater than 0.1 units, re-do the measurement of the sample just tested including calibration and verification.

11. Reporting

Report the average value of the replicate measurement to the nearest 0.1 units.

## Field Measurement of Specific Conductance and Temperature

### 1. Scope and Application

This method is applicable to samples of surface water and groundwater with measurement occurring at the sampling point.

### 2. Summary of Method

The specific conductance and temperature of water is determined using a portable, field conductivity meter having manual temperature compensation.

### 3. Apparatus

- A) YSI Model 33 S-C-T Meter with weighted probe.
- B) 100 ml disposable beakers

### 4. Reagents

- A) 0.01 N KCL reference solution
- B) distilled water

### 5. Sample Handling and Preparation

Sample aliquots for specific conductance and temperature should be obtained directly from the sampling point in 100 ml disposable beakers.

### 6. Calibration

Calibrate the thermometer in the probe against the field thermometer. Readings should be within  $\pm 1^{\circ}\text{C}$ . Calibrate the specific conductance meter using the 0.01 N KCL reference solution. The specific conductance of this solution is 1413  $\mu\text{mhos/cm}$  at  $25^{\circ}\text{C}$ . Adjust the meter as needed. Temperature calibration should be performed weekly. Specific conductance calibration should be performed daily during the period of use. For additional information see SIPM Method 6617002.

7. Procedure

Check battery condition by turning selector dial to "Red Line". Adjust meter as needed. Immerse the probe in the beaker while gently agitating. Turn selector dial to "Temperature" and record temperature to nearest 0.5°C. Adjust manual temperature compensation dial to temperature of water. Turn selector dial to "Conductivity" at the scale range appropriate to sample conductance. Record specific conductance to three significant digits. Remove and thoroughly rinse the conductance probe and repeat measurements until four sets of readings have been obtained. For additional information see SAMP 5617002.

8. Assessment of Precision

Calculate the mean and standard deviation of the four specific conductance measurements. If the standard deviation is greater than 5% of the means, re-do the measurement of the sample just tested.

9. Reporting

Report the average values of the replicate measurement to the nearest 1°C for temperature and to three significant digits for specific conductance.

**APPENDIX B**  
**COLLECTION OF WATER SAMPLES FROM**  
**RESIDENTIAL WATER SUPPLIES**

## COLLECTION OF WATER SAMPLES FROM RESIDENTIAL WATER SUPPLIES

### 1.0 INTRODUCTION

This procedure shall be used to collect samples from existing residential water supplies for all non-microbiological analyses. The primary objective of this technique is to collect a sample representative of the groundwater supply and not water standing in the delivery system or well casing.

In a nonpumped well, there will be little or no vertical mixing of the water, and stratification may occur. Water in the screened section will mix with the groundwater due to normal flow patterns, but the well water above the screened section will remain isolated and become stagnant. Stagnant water may contain foreign material inadvertently or deliberately introduced from the surface, resulting in nonrepresentative data and misleading interpretations.

In most cases, groundwater samples from existing residential water supplies are obtained from taps or spigots on the existing delivery system. The installation of a new tap for sampling purposes is not usually warranted. Samples should be collected from the tap closest to the well as practical and upstream of any filtration or water treatment device.

Two separate operational steps are required to obtain a representative sample.

- o presampling system purging, followed by
- o sample collection

## 2.0 PRESAMPLE PURGING

Before any samples are collected, all standing (stagnant) water should be purged or removed from the delivery system. The volume of water contained in the well casing, pressure or holding tanks, and other plumbing and appurtenances (pipes, hoses, etc.) should be determined.

The system should then be purged with a minimum of three (3) times the calculated casing volume before sampling commences. Care should be exercised before pumping a well to preclude the possibility of overpumping. Excessive pumping can result in flow entering a well from outside the zone of interest. The purging necessary to obtain a sample representative of the groundwater supply depends on a number of factors;

- o pump intake level
- o specific capacity of the aquifier
- o well efficiency

Information obtained during pumping is required to determine the specific capacity of the aquifier and well efficiency, therefore, the purging volume can only be estimated for a specific well for the initial sampling. Well performance data from the initial sampling should be recorded for future sampling.

If the sampling tap or spigot has an aerator or filter, it should be removed prior to purging and sampling. Provisions should also be made to dispose of the presample purge water.

For most sampling, purge water may be discharged directly to the sanitary sewer or on the ground at least thirty (30) feet from the well. If gross contamination of the purge water is anticipated, provisions should be made for proper containment and disposal. Ideally, the contaminated purge water should be contained and stored until the water samples have been analyzed. Once the contaminants



have been identified, appropriate treatment and/or disposal alternatives can be determined.

### 3.0 SAMPLING

After the required volume of water is purged from the delivery system, the sampling tap should be shut off. Sample bottles with required preservatives should then be brought to the sampling point. Turn tap on, adjusting the flow to about 100 ml/min. Fill sample bottles as required for specific analyses to be completed. Shut off tap. Reconnect all filters, aerators, and treatment systems.

In addition to information normally recorded in field notebook (as described in Procedure 5621004), the following information should be included:

- o resident's name
- o address
- o sampling location (specific tap or spigot)
- o filtering or treatment systems on delivery system
- o aerator or filter on sampling tap
- o well casing diameter (ID)
- o water level
- o well volume
- o pressure on holding tank volume
- o appurtenances and other plumbing volume
- o total delivery system volume
- o purge flow rate
- o purge time
- o total purge volume

### 4.0 REFERENCES

NEIC Manual for Groundwater/Subsurface Investigations at Hazardous Wastes Sites (July 1981) Steven W. Sisk

National Enforcement Investigations Center, Denver, Colorado

Procedure: 5617008  
Revision: 0  
Date: 4/85  
Page: 4 of 4

Manual of Groundwater Sampling Procedures, Scalf, McNabb, Dunlap,  
Cosby, Fryberger ~~NWPA~~ EPA Series

US4154

**APPENDIX C**  
**EXCERPT FROM USEPA SAMPLE HANDLING MANUAL**

## **SAS PACKING LIST**

1. Insert assigned SAS case number.
2. Insert EPA region number, V and your contractor company name.
3. Insert sample team leader's name.
4. Insert sample team leader's office telephone number (do not use field office telephone number).
5. Insert date sample was taken.
6. Indicate date of shipment.
7. Insert the site name only if it does not copy onto the lab's copy (see note below). Also list the site/spill ID.
8. Insert laboratory name and address, and the carrier name and airbill number.
9. Indicate name of laboratory contact.
10. List SAS sample numbers, which should include SAS number (i.e., if the SAS # is 2743E, the samples would be numbered as 2743E-01, 2743E-02, etc.)
11. Specify sample matrix, concentration, tag number, and analysis to be performed (e.g., low concentration soil sample for PCB analysis, tag number 5-48246).  
Indicate whether shipment is complete at the bottom of the form.
12. Leave BLANK - laboratory use only.

**NOTE:** The site name should not be written on this form while all copies are attached if there is no protection to prevent the site name from appearing on the lab's copies. The CLP laboratory should not have this information. Therefore, either use a site code or separate the copies and only write the site name on the Regional and SMO copies of this form, if necessary.

### **THIS IS A FOUR COPY FORM:**

The top copy should be sent to SMO within a day or two of shipping samples.

The second (yellow) copy should be sent with other paperwork for a site to the Region V RSCC.

The bottom two copies (pink and gold) get sent to the CLP laboratories with the samples.

U.S. ENVIRONMENTAL PROTECTION AGENCY  
CLP Sample Management Office  
P.O. Box 818 - Alexandria, Virginia 22313  
Phone: 703/557-2490 - FTS/557-2490

SAS Number  
①

SPECIAL ANALYTICAL SERVICE  
PACKING LIST

Sampling Office: ②	Sampling Date(s): ⑤	Ship To: ⑧	For Lab Use Only
Sampling Contact: ③	Date Shipped: ⑥	Attn: ⑨	Date Samples Rec'd:
(name)	Site Name/Code: ⑦		Received By:
④			
(phone)			

Sample Numbers	Sample Description i.e., Analysis, Matrix, Concentration	Sample Condition on Receipt at Lab
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10. ⑩	⑪	⑫
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		

For Lab Use Only



White - SMO Copy, Yellow - Region Copy, Pink - Lab Copy for return to SMO, Gold - Lab Copy

## **SAMPLE TAG**

1. Enter your project number for the site, which may be the first six digits of the CRL log number (see page C-21).
2. Enter the sampling station code, i.e., MW1, BLK, SS1, etc.
3. Enter date of sampling.
4. Enter time of sampling (military time only).
5. Specify "grab" or "composite" sample with an "X".
6. Insert station location. If the sample is a field blank or if to be used for the spike or duplicate analysis, notate here.
7. Obtain signature of sample team leader.
8. Indicate presence of preservative with an "X".
9. Specify analytes for analysis with an "X".
- 10a. Indicate traffic report number (i.e., EW846 or MEX013) for that sample if the samples are being shipped to the CLP. If the samples are going to the CRL, list the CRL log number.
- 10b. Indicate the case number.
11. Leave BLANK (for laboratory use only).
12. Enter any desired analyses not listed on the tag provided (e.g., PCB's, ammonia, sulfide, etc.) and mark the box with an "X".

NOTE: Each sample container should have a separate tag.  
All field blanks should be designated as such on the sample tags, either in the 'Remarks' field (10a and 10b) or in the 'Station Location' field (6).

# Sample Tag

<b>UNITED STATES ENVIRONMENTAL PROTECTION AGENCY</b> <b>REGION 5</b> <b>230 South Dearborn Street</b> <b>Chicago, Illinois 60604</b> 							
Project Code <b>(1)</b>	Station No. <b>(2)</b>	Month/Day/Year <b>(3)</b>	Time <b>(4)</b>	Dry/Dry Ice Camp <input checked="" type="checkbox"/> Grab <input type="checkbox"/>	<b>(5)</b>	<b>(7)</b>	Preservative: Yes <input type="checkbox"/> No <input type="checkbox"/>
							<b>(8)</b>
<b>Station Location</b> <b>(6)</b>						<b>ANALYSES</b>	
						BOD Anions	
						Solids (TSS) (TDS) (SS)	
						COD, TOC, Nutrients	
						Phenolics	
						Mercury	
						Metals	
						Cyanide	
						Oil and Grease	
						Organics GC/MS	
						Priority Pollutants	
						Volatile Organics	
						Pesticides	
						Mutagenicity	
Bacteriology							
Remarks:							
<b>(10a)</b> <b>(10b)</b>							
<b>(11)</b>							
<b>(12)</b>							
<b>(9)</b>							

Front

Back

Each cooler should have 2 CDC seals applied.

U.S. ENVIRONMENTAL PROTECTION AGENCY REGION V OFFICIAL SEAL No. 13400
--

Chain of Custody Seal

## INTRODUCTION AND INSTRUCTIONS FOR USE OF MULTI-SAMPLE ORGANIC AND INORGANIC TRAFFIC REPORTS

### A. Introduction: Samples and Sample Numbers

Contract Laboratory Program (CLP) multi-sample Traffic Reports (TRs) can document up to twenty samples shipped to one CLP laboratory under one Case Number. The TRs must be used for every shipment of RAS samples to a CLP laboratory.

The CLP's definition of "samples" is based on the RAS analytical program: (1) organic, (2) VOA only (3) inorganic.

A CLP sample is one matrix — water or soil — and consists of all the sample aliquots from a sample station location for analysis in one RAS analytical program. The CLP assigns a unique Sample No. to each such set of aliquots sent to one CLP laboratory. The unique Sample Numbers are printed on the adhesive labels. The samplers must accurately transfer this critical Sample Number to the TR.

Organic Sample Numbers are in the format XX123, and have six labels per strip: four for extractables, and two for VOAs (see attachment). CAUTION: The organic sample labels provide two options for each Sample No. — labels for water samples and labels for soil samples. USE ONLY ONE OF THE TWO OPTIONS. An individual sample will be analyzed as EITHER a water or a soil, but never both. DESTROY THE UNUSED LABELS to prevent duplication of Sample Numbers.

Inorganic Sample Numbers are in the format MXX123 and have seven labels per strip: two for Total Metals, two for Cyanide and three extra (see attachment). Remember that the unique Sample No. must only be used once so DESTROY THE EXTRA LABELS.

Use only the labels provided to the Region in which you are sampling. CLP Sample Numbers are an alphanumeric code specific to each Region:

Letter Code		Letter Code	
<u>Organic</u>	<u>Inorganic</u>	<u>Organic</u>	<u>Inorganic</u>
	Region		Region
A, MA	I	F, MF	VI
B, MB	II	G, MG	VII
C, MC	III	H, MH	VIII
D, MD	IV	Y, MY	IX
E, ME	V	J, MJ	X



**REMEMBER:**

- o TRs must be used for each Case No. with every shipment of samples to each CLP laboratory.
- o Organic samples, "VOA Only" samples, and inorganic samples are assigned separate, unique Sample Numbers. Each consists of all the sample aliquots from a sample station location.
- o A CLP RAS sample will be analyzed as either a water or a soil sample.
- o Prevent accidental duplication of Sample Numbers by destroying unused labels.
- o Use only the Sample Numbers specific to your Region.

**B. Completing the Form - Case Documentation**

Enter the Case No. and SAS No. (if applicable) at the top right of the form.  
Complete the boxes in the header:

Box No. 1:

**Type of Activity:**

If sampling is under Superfund, circle the code which describes the task of the sampling mission:

PA -	Preliminary Assessment
SI -	Site Investigation
ESI -	Expanded Site Investigation
RIFS -	Remedial Investigation Feasibility Study
RD -	Remedial Design
RA -	Remedial Action
ER -	Emergency Response (Removal)
NPLD -	National Priorities List Delete
O + M -	Operations and Maintenance

If sampling is not under the Superfund program, enter the name of program, e.g., RCRA. Enter the site name, the city, state, and Site Spill ID (provided by Region) in the designated spaces.

**Box No. 2:**

**Regional Information**

Enter the Region number, the name of your sampling company, and your name in the designated spaces.

**Box No. 3:**

**Ship To:**

Enter the name of the CLP laboratory and its full address in the box. Enter the name of the sample custodian or CLP contact in the box provided.

Enter the beginning and ending sampling dates in the designated spaces.

Enter the date shipped, the carrier code (e.g., F = Federal Express, P = Purolator, etc.) and the airbill number in the appropriate spaces.

**C. Completing the Form - Sample Documentation**

Carefully transcribe the CLP Sample No. from the printed sample labels on the TR in the space provided.

Complete columns A through E to describe the sample:

**Column A, Sample Description:**

Enter the appropriate sample description code from Box 6. NOTE: Describe RINSATES or BLANKS as #3 "Leachate" in Column A. Write the word "Rinsate" or "Blank" in Column D, the Special Handling section, or in Column E, the Station Location section. Note: Item #3 "Oil" and Item #7 "Waste" are for RAS PLUS SAS projects only. Do not ship oily samples or waste without making prior arrangements with SMO.

**Column B, Concentration:**

Organic - If sample is low or medium concentration, enter "L". When shipping RAS plus SAS high concentration samples (previously arranged with SMO), enter "H".

**Inorganic -** Enter "L" for low concentration, "M" for medium concentration, and "H" for high concentration (under previous RAS plus SAS arrangement).  
**REMINDER:** Ship medium and high concentration organic and inorganic samples in metal cans.

**Column C: RAS Analysis:**

Check the analytical fractions requested on each sample.

**Column D: Special Handling:**

Use this space to relevant specify any special handling requirements. Rinse or blank samples should be identified as such in this space. When shipping RAS plus SAS samples you may code SAS parameters in the blank space (e.g., A = sulfate, B = Cl, etc.) and enter the codes in this column.

**Column E: Station Location:**

Enter the station location in the space provided.

**IMPORTANT:** SAMPLERS MUST INDICATE ON EACH TRAFFIC REPORT WHETHER SAMPLING IS COMPLETE OR IF MORE SAMPLES WILL BE SHIPPED UNDER THE SAME CASE NUMBER. THIS STATEMENT CAN BE WRITTEN ANYWHERE ON THE FORM THAT DOES NOT OBSCURE NECESSARY INFORMATION, AND CAN BE AS SIMPLE A STATEMENT AS "SHIPMENT COMPLETE FOR THIS CASE" OR "MORE SAMPLES TO COME UNDER THIS CASE."

Р.О. ДОК ПИС "АЛЕКСАНДРИЯ" 2013

700/557-2490 H.S. FTS-557-2490

# ORGANIC TRAFFIC REPORT

TYPE OF ACTIVITY (CIRCLE ONE) ① SUPERFUND—PA ④ ESI RPT'S NO RIA BR NPLD OLM OTHER _____ ON SUPERFUND _____ PROGRAM		SHIP TO: Spectrix ② 3911 Farnham Suite 100 Houston, TX Ted Osterman		SAMPLE DESCRIPTION (ENTER IN BOX A) ③ 1. SURFACE WATER 4. SOIL 2. GROUND WATER 5. SEDIMENT 3. LEACHATE 6. OIL (SAS) 7. WASTE (SAS)	
SITE NAME: Cheer's Dump CITY, STATE: Boston, MA. SITE SPILL ID: ZF		ATTN: Ted Osterman		TRIPLE VOLUME REQUIRED FOR MATRIX SPIKE/DUPLICATE AQUEOUS SAMPLE	
REGION NO: I SAMPLING COMPANY: ② Acme		SAMPLING DATE: ④ BEGIN: 8/10/87 END: 8/11/87		SHIP MEDIUM AND HIGH CONCENTRATION SAMPLES IN PAINT CANS	
ANALYST: (NAME) Geo. Koziet		DATE SHIPPED: 8/11 CARRIER: F ⑤ AIRBILL NO: 123-456-7890		SEE REVERSE FOR ADDITIONAL INSTRUCTIONS	

[illegible]

**SMO COPY**

WHITE - SMO COPY

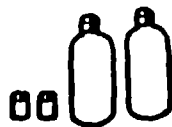
**PINK - CLIENT COPY**

WHITE - LAB COPY FOR RETURN TO SMO

**YELLOW - LAB COPY**

C-5

**US4164**



MM 123 - 70158)

AA 123 - 703A<sup>8</sup>,)

AA 12<sup>9</sup> WATER  
(EXTRACTABLE)

AA 123 - WATER  
(EXTRACTABLE)



AA 124 - SOIL/SEDIMENT

AA 124 - SOIL/SEDIMENT  
(VOCs)

AA 124 - SOIL/SEDIMENT  
(EXTRACTABLES)



AA 125 - 70818)

AA 125 - 700A<sup>2</sup>s)

UNITED STATES DEPARTMENT OF JUSTICE  
FEDERAL BUREAU OF INVESTIGATION  
WASHINGTON, D. C. 20535

REPORT OF INVESTIGATION

TO : DIRECTOR, FBI

FROM : SAC, NEW YORK

SUBJECT: [REDACTED]

DATE: 1/10/68

RE: [REDACTED]

1. [REDACTED]

2. [REDACTED]

3. [REDACTED]

4. [REDACTED]

5. [REDACTED]

6. [REDACTED]

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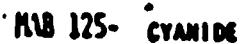
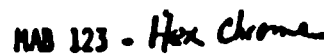
264. [REDACTED]

265. [REDACTED]

44 123  
POLYMER  
(EXTRACTABLES)

MA 124 - YAFF  
-TRACTABLES)

TEAR UP THE CORRESPONDING UNUSED SAMPLE LABELS

[illegible]

123B 123 -  
123 124- TOTAL METALS  
CYANIDE

**TEAR UP THE CORRESPONDING UNUSED SAMPLE LABELS**

**US4166**

C-7

**SAMPLER INSTRUCTIONS FOR USE OF  
MULTI-SAMPLE ORGANIC AND INORGANIC TRAFFIC REPORTS  
HORIZONTAL FORMAT  
EPA FORM #9110-1 (INORGANICS) AND  
FORM 9110-2 (ORGANICS)**

1/20/89

**A. Introduction - Samples and Sample Numbers**

The Contract Laboratory Program (CLP) Organic and Inorganic Multi-Sample Traffic Reports (TRs) document samples shipped to CLP laboratories. You must use TRs each time you ship Routine Analytical Services (RAS) samples to a CLP laboratory. The new horizontal version of the multi-sample TRs may document up to 20 samples shipped to one CLP laboratory under one Case Number and RAS analytical program.

CLP sample types are defined by the RAS analytical program. There are currently three organic/inorganic programs: inorganic, organic, and fast-turnaround VOAs. Inorganic samples may be analyzed for Total Metals, Cyanide or both. Organic samples may be analyzed for Volatile Organics (VOAs), Base/Neutral/Acid (BNAs), Pesticide/PCBs, or any combination of these. VOA-Only samples are in a separate program from organics because of the faster turnaround provided. Inorganic samples are documented on Inorganic TRs. Organic and VOA-Only samples are documented on Organic TRs.

A CLP sample is one matrix — water or soil — never both. The CLP sample is further defined as consisting of all the sample aliquots from one station location, for each matrix and RAS analytical program. For example, let's say you were sampling at Pond A. You plan to collect one water sample and one soil/sediment sample, each to be analyzed for VOAs, BNAs, Pesticide/PCBs, Total Metals and Cyanide. All the bottles for the organic water analyses at this station — VOA vials, BNA jars, and Pesticide/PCB jars — make up one organic CLP sample, not three. All of the bottles for the organic soil analysis — VOA vials and BNA/Pesticide/PCB jars — make up the second organic CLP sample. The bottles for inorganic water analysis at this station — one for Total Metals and one for Cyanide — make up one inorganic CLP sample, not two. The bottle for inorganic soil analysis makes up the second inorganic CLP sample from Pond A. Even though you have collected a water and a soil for five different analyses from Pond A, you've collected four CLP samples — an organic water, an organic soil, an inorganic water and an inorganic soil.

The CLP generates unique Sample Numbers which must be assigned to each organic, VOA-Only, and inorganic sample. The unique CLP Sample Numbers are printed on the adhesive labels. It is your responsibility to assign this critical Sample Number correctly and to transcribe it accurately on the TR.

If the organic sample will be split between a 14 day VOA-only lab and a RAS organic lab, two CLP sample numbers for each sample must be used. The VOA only lab sample would have one number and the ABN/Pesticides/PCBs sample fraction would be assigned another number. A good rule of thumb is one sample number per sample per lab.

Organic and VOA-Only Sample Numbers are in the format XX123, and have ten labels per strip: four for extractables, two for VOAs, and four blank (extra). (See Attachment 1.) **DESTROY THE UNUSED LABELS** to prevent duplication of Sample Numbers.

Inorganic Sample Numbers are in the format MXX123 and have seven labels per strip: two for Total Metals, two for Cyanide and three extra (see Attachment 1). Remember that the unique Sample No. must only be used once. **DESTROY THE EXTRA**

US4167

Use only the labels provided to the Region in which you are sampling. CLP Sample Numbers are alphabetically coded to correspond with each Region as follows:

Letter Code			Letter Code		
Organic, Inorganic		Region	Organic, Inorganic		Region
A	MA	I	F	MF	VI
B	MB	II	G	MG	VII
C	MC	III	H	MH	VIII
D	MD	IV	Y	MY	IX
E	ME	V	J	MJ	X

**REMEMBER:**

- o TRs must be used for each Case No. with every shipment of samples to each CLP laboratory.
- o Organic samples, VOA-Only samples, and inorganic samples are assigned separate, unique Sample Numbers. Each sample consists of all the sample aliquots from a sample station location for analysis in one of the three analytical programs.
- o A CLP RAS sample will be analyzed as either a water or a soil sample.
- o Prevent accidental duplication of Sample Numbers by destroying unused labels.
- o Use only the Sample Numbers specific to your Region.
- o The samplers must indicate on each Traffic Report whether shipment is complete.

**B. Completing the Form - Case Documentation**  
(Attachments 2 & 3)

Enter the Case No. and SAS No. (if applicable) at the top right of the form. Complete the boxes in the header:

Box No. 1:

**Type of Activity:**

If sampling is under Superfund, circle the code which describes the task of the sampling mission:

ENF	- Enforcement	RD	- Remedial Design
ER	- Emergency Response (Removal)	RIFS	- Remedial Investigation Feasibility Study
ESI	- Expanded Site Investigation	SI	- Site Investigation
NPLD	- National Priorities List Delete	ST	- State Lead
O + M	- Operations and Maintenance	STPA	- State Lead Assessment
PA	- Preliminary Assessment	STSI	- State Lead Site Investigation
RA	- Remedial Action	Other	- Please Specify

If sampling is not under the Superfund program, enter the name of program, e.g., RCRA.

Enter the site name, the city, state, and Site Spill ID in the designated spaces.



**Box No. 2:**

**Regional Information:**

Enter the Region number, the name of your sampling company, and your name in the designated spaces.

**Box No. 3:**

**Ship To:**

Enter the name of the CLP laboratory and its full address in the box. Enter the name of the sample custodian or CLP contact in the box provided.

**Box No. 4:**

**Shipping Information:**

Enter the date shipped, the carrier code (e.g., F = Federal Express, P = Purolator, etc.) and the airbill number in the appropriate spaces.

**C. Completing the Form - Sample Documentation  
(Attachments 2-3)**

Carefully transcribe the CLP Sample No. from the printed sample labels on the TR in the space provided.

Complete columns A through G to describe the sample:

**Column A, Sample Description:**

Enter the appropriate sample description code from Box 5. NOTE: Describe BLANKS as #3 "Leachate" in Column A. Write the word "Blank" in Column D, the Special Handling section. Note: Item #6 "Oil" and Item #7 "Waste" are for RAS PLUS SAS projects only. Do not ship oily samples or waste samples without making prior arrangements with SMO.

**Column B, Concentration:**

Organic - If sample is estimated to be low or medium concentration, enter "L". When shipping RAS Plus SAS high concentration samples (previously arranged with SMO), enter "H".

Inorganic - Enter "L" for low concentration, "M" for medium concentration, and "H" for high concentration (under previous RAS Plus SAS arrangement).

REMINDER: Ship medium and high concentration organic and inorganic samples in metal cans.

**Column C: RAS Analysis:**

Check the analytical fractions requested on each sample.

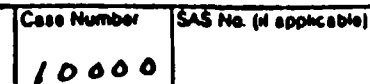
**Column D: Special Handling:**

Use this space to specify any special handling requirements. Blank samples should be identified as such in this space. When shipping RAS Plus SAS samples you may code SAS parameters in the blank space (e.g., A = sulfate, B = Cl, etc.) and enter the codes in this column.

**D. Instructions on the Reverse  
(Attachments 4-5)**

US4169

Instructions summarizing CLP sample volumes, packaging and reporting requirements are printed on the back of the TR.

[illegible]

US417a

三、

Case Number	SAS No (if applicable)
10,000	

[illegible]

USA171

C-12

## CHAIN-OF-CUSTODY FORM

1. Enter your project # or the first six digits of the CRL log number (see page C-20).
2. Enter the case number or SAS number (do not enter the site name).
3. Obtain the full signature of sample team leader.
4. Enter the traffic report sample number or the SAS sample number.
5. List sampling dates for all samples.
6. List sampling times for all samples.
7. Indicate "grab", "composite" sample with an "X".
8. List station locations and other information . i.e.. 'blank', use for the HS/MSD. etc.
9. Enter number of containers per sample and container volume (e.g..2-40 ml).
10. List analyses individually. (VOA,ABN,PEST/PCB,MET,CN,etc.; for soils, metals and cyanide are taken from the same container, therefore the MET & CN should be together in one column.)
11. Construct column heading for "tag number" and list tag numbers for each sample container.
12. Obtain signature of sample team leader and carry out chain of custody procedures.
13. State carrier service and air bill number. lab service. and custody seal numbers are written here.

### NOTE:

One Chain-Of-Custody should be filled out per shipping container. The purpose of using site code is to prevent the contract laboratory from obtaining the site name. An alternative to using a site code is to separate the copies and write the site name on your copy and the Region's copy, leaving that field blank on the lab's copy.

### THIS IS A THREE COPY FORM:

The top copy goes to the CRL or CLP laboratory with the samples. The second copy (pink) goes to SMO if the samples are going to the CLP. The last copy (yellow) goes to the RSCC with other paperwork for the site (for samples shipped to the CLP).

(continued)

**CHAIN OF CUSTODY FORM (continued)**

If numbered CDC seals are not available from Region V, then the alternate CDC seal (a white seal that needs to be signed and dated upon use) should be used. In this case, a note should be made on the CDC form indicating that these seals were used instead of the numbered seals.

For samples coming to the CRL for analysis, the site name should be entered. The CRL log number should be used to identify the sample (instead of the traffic report number), as well as the tag number and analyses requested.

Also, list the QC bottle lot numbers in the remarks area if you are not tracking this on your sampling matrix.

## CHAIN OF CUSTODY RECORD

[illegible]

USA17A

# CENTRAL REGIONAL LABORATORY SAMPLE DATA REPORT (CRL-SDR)

1. Insert assigned laboratory case number.
2. Insert site name.
3. Insert laboratory names, indicating which lab will receive the organic samples and which lab will receive the inorganic samples.
4. Insert date of shipment.
5. Insert DU code (either TFA102 for site inspection or remedial, or TGB102 for enforcement, including PRP sites).
6. Insert name of RPM (the RPM will know what the site DU code is).
7. Enter the Cerclis number.
8. Insert page number and total number of pages.
9. Enter the site/spill ID code (a 2 digit preassigned EPA code).
10. Insert CRL log number, which consists of the fiscal year, EPA assigned contractor code, sample type designation and sample number.

Example:    8 9 Z A 0 1 S 0 1  
              a    b    c    d    e

a.	b.	c.	d.	e.
FY -	contractor	this should	sample type	sample
Fed.	code	be a sequential	S-sample	number
Fiscal		number	D-duplicate	
(Oct.-Sept.)		i.e., 01, 02,	R-field or	
		03, etc.	trip blank	

89ZA01S01 would be a sample.  
89ZA01D01 would be a field duplicate of sample 89ZA01S01.  
89ZA01R01 would be a field blank.

11. Insert organic traffic report number.
12. Insert inorganic traffic report number.
13. Indicate the analyses required (eg. acid-base neutral cpds., volatile organic analysis, etc.) for each sample in the appropriate section (for waters or soils) with an "X".

Note: All samples should have a unique number. If a sample is collected for filtered and unfiltered metals analyses, a separate ITR should be filled out for each bottle (the filtered and unfiltered). Each one of these samples would then be assigned a unique CRL log number. In order to distinguish between the filtered and unfiltered samples, they can be listed on the CRL-SDR with a column heading indicating 'filtered metals'.

(continued)

Central Regional Laboratory Sample Data Report (continued)

THIS IS A SINGLE COPY FORM:

This form must be filled out for all SF samples which will go to contract labs and must be sent to the Region V RSCC with the other paperwork required for a site. A copy must also be sent to SMO with the TRs and the CDCs.

The contractor codes list below should be consulted when generating the CRL log number. A minimum of approximately 10,000 unique CRL log numbers can be generated for each contractor per fiscal year using this numbering system.

<u>Contractor</u>	<u>Code</u>
REM II	R
REM III	VA
REM IV	H
REM V	VB
ARCS/Other	
Warzyn	ZA
Black & Veatch	ZB
CH2	ZC
Donahue	ZD
E&E	ZE
PRC	ZF
Weston	ZG
WV Science	ZH
EPA Personnel	
RCRA	K
TES	J
TAT	UT
FIT	F
MDNR	M
WDNR	X
MPCA	Y



**THIS FORM IS TO BE USED FOR SAMPLES SENT TO CONTRACT ONLY**

SITE/SPILL ID	WATER OR LIQUIDS	SEDIMENTS or SOILS
9	13	

US4177

**Appendix D**

**Contract Laboratory Program Sample Collection Requirements  
For Routine Waters and Soils. High Hazard Liquids and Solids  
and Dioxin Samples**

**D-1  
through  
D-3**

**CLP Sample Collection Requirements For Routine  
Water and Soil Samples for Organics and Inorganics  
Low, Medium and High Concentration and Dioxin Samples**

ANALYSIS	REQUIRED VOLUME	# OF CONTAINERS	CONTAINER TYPE	PRESERVATIVE
<hr/>				
<b><u>WATER SAMPLES</u></b>				
Metals-low level (Hg included)	1 liter	1	1 liter polyethylene bottle	HNO <sub>3</sub> to a pH<2
*Metals-medium level (Hg included)	1 liter	1	16 oz. wide wide mouth bottle	HNO <sub>3</sub> to a pH<2
Cyanide- low level	1 liter	1	1 liter polyethylene bottle	NaOH to a pH>12 Cool, 4° C **1.2g ascorbic acid
*Cyanide-medium level	1 liter	1	1 16 oz. wide wide mouth bottle	NaOH to a pH>12 Cool, 4° C **1.2g ascorbic acid
Extractables-low level	1 gallon	2 or 4	80 oz. amber glass bottles  1 liter amber glass bottles	Cool, 4° C
*Volatile-low or medium level	80 ml	2	40 ml glass vials	Cool, 4° C. Preserve low level samples with 1-2 drops HCl to pH<2. Samples must be free of headspace.
<hr/>				
<b><u>SOIL SAMPLES</u></b>				
*Metals and cyanide, low or medium level	6 oz.	1 or 2	8 oz. wide mouth glass bottles  4 oz. wide mouth glass bottles	
*Extractables-low or medium level	6 oz.	1 or 2	8 oz. wide mouth glass bottles  4 oz. wide mouth glass bottles	Cool, 4° C
*Volatiles-low or medium level	240 ml	2	120 ml wide mouth glass vial	Cool, 4° C: vial must full and free of headspace

**Sample collection Requirements (continued)**

<b>ANALYSIS</b>	<b>REQUIRED VOLUME</b>	<b># OF CONTAINERS</b>	<b>CONTAINER TYPE</b>	<b>PRESERVATIVE</b>
<b><u>HIGH HAZARD SAMPLES</u></b>				
*Liquid Samples- organic and inorganic	4 oz.	2	4 oz. wide mouth glass bottle	Note: One bottle is for inorganics. the other is for organics
*Solid Samples- organic and inorganic	4 oz.	2	4 oz. wide mouth glass bottle	(same as above)

**DIOXIN SAMPLES**

*2,3,7,8-TCDD	4 oz.	1	4 oz. wide mouth glass bottle
---------------	-------	---	-------------------------------

\* All medium level, high hazard, and dioxin samples must be sealed in metal paint cans for shipment. The outer metal can must be labeled with the number of samples contained inside.

\*\* Should only be used in the presence of residual chlorine.

All low level sample containers must be enclosed in clear plastic bags before placing in the cooler for shipment.

All samples should be shipped in ice chests packed with non-combustible, absorbent packing material (vermiculite) surrounding the plastic enclosed sample bottles (or metal cans containing samples).

Traffic Reports, Dioxin Shipment Records, SAS Packing Lists, Chain of Custody Records and any other shipping/sample documentation accompanying the shipment must be enclosed in a waterproof plastic bag and taped to the underside of the cooler lid.

Coolers must be sealed with Region V numbered custody seals in such a manner that the custody seals would be broken if the cooler were opened. Water proof tape must cover the custody seals.

Water samples for organic matrix spike/matrix spike duplicate analysis must be collected at double the volume specified for Extractables and triple the volume specified for Volatiles.

The RAS/SOWs require lab QC (MS/MSD for organics, a spike and a duplicate for inorganics) to be done at a frequency of one set of QC for each 20 samples (or less) of the same matrix in each Case. (It is important that the traffic reports contain a statement indicating whether sample shipment is complete or if more samples will be coming to the lab under that Case number so that the lab can proceed with the analyses.) If more than 20 water samples are

**CLP-Sample Collection Requirements (continued)**

collected for a Case. extra volume for the MS/MSD analyses must be collected for every group of 20 organic samples or less.

For water and soil samples, field blanks and duplicates should be supplied at the frequency prescribed in the approved QAPP for the site.

No additional soil volume is required for laboratory analysis of MS/MSD (organics) or spikes and duplicates (inorganics).

The water Volatiles sample must be preserved with 4 drops of 1:1 HCl or 2 drops of concentrated HCl to a pH<2. This is due to a new CLP holding time of 10 days (instead of 7 days).

**Appendix F**

**Residential Well Sample Collection Requirements for CRL and CLP**

**F-1**

# **Residential Well Sample Collection Requirements For CRL and CLP**

ANALYSIS	REQUIRED VOLUME	# OF CONTAINERS	CONTAINER TYPE	PRESERVATIVE
Metals	1 liter	1	1 liter polyethylene bottle	HNO <sub>3</sub> to a pH<2
Cyanide	1 liter	1	1 liter polyethylene bottle	NaOH to a pH>12 Cool. 4° C **Special handling if residual chlorine or sulfide is suspected
Mercury	500 ml	1	1 liter polyethylene bottle	10 ml of preservative so that final concentration is 0.05% (w/v) K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> and 0.5% (w/v) HNO <sub>3</sub>
Pest/PCB (Organics)	1 liter*	1	1 liter amber glass bottle completely full	Cool. 4° C
Acid/Base/Neutral (organics)	1 liter*	1	1 liter amber glass bottle completely full	Cool. 4° C
Volatile Organics	120 ml	48	40 ml glass vials	Cool. 4 C Samples must be free of headspace.

\* A total of three 1 liter bottles is required per sample if ABN and Pest/PCBs are requested. The extra bottle is used for re-extraction, if necessary.

Note: A total of 8 1 liter bottles is required for the sample chosen for the Matrix Spike and Matrix Spike Duplicate analysis of ABN and Pest/PCBs.

A total of 8 vials is required for the sample chosen for the Matrix Spike and Matrix Spike Duplicate analysis of volatiles.

No extra volume is required for the spike and duplicate analysis of metals, cyanide and mercury, however, the sampler should indicate on the sample tags which samples should be used for the lab duplicate and lab spike analysis.

Mercury Preservative: Dissolve 250ml of concentrated HNO<sub>3</sub> and 25g of K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> in deionized distilled water and dilute to one liter. Collect approximately 500ml of sample and add 10ml of this preservative.

Caution: Do not store the preservative solution in plastic containers.

FILE COPY

SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION  
OPERABLE UNIT WORK PLAN

PREPARED FOR:

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY  
DIVISION OF LAND POLLUTION CONTROL  
REMEDIAL PROJECT MANAGEMENT SECTION  
FEDERAL SITE MANAGEMENT UNIT  
2200 CHURCHILL ROAD  
SPRINGFIELD, ILLINOIS 62794-9276

MAY 1990

QUALITY ASSURANCE BRANCH

MAY 07 1990

ENVIRONMENT SERVICES DIVISION

QUALITY ASSURANCE BRANCH

MAY 07 1990

ENVIRONMENT SERVICES DIVISION



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Plate A Proposed and Historical Sample Locations

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## 1.0 INTRODUCTION

This Work Plan has been prepared to define the scope of activities required to perform a Remedial Investigation (RI) and Feasibility Study (FS) for an Operable Unit within the Southeast Rockford study area. The Work Plan addresses the requirements as described in the revised Statement of Work (SOW) dated August 29, 1989.

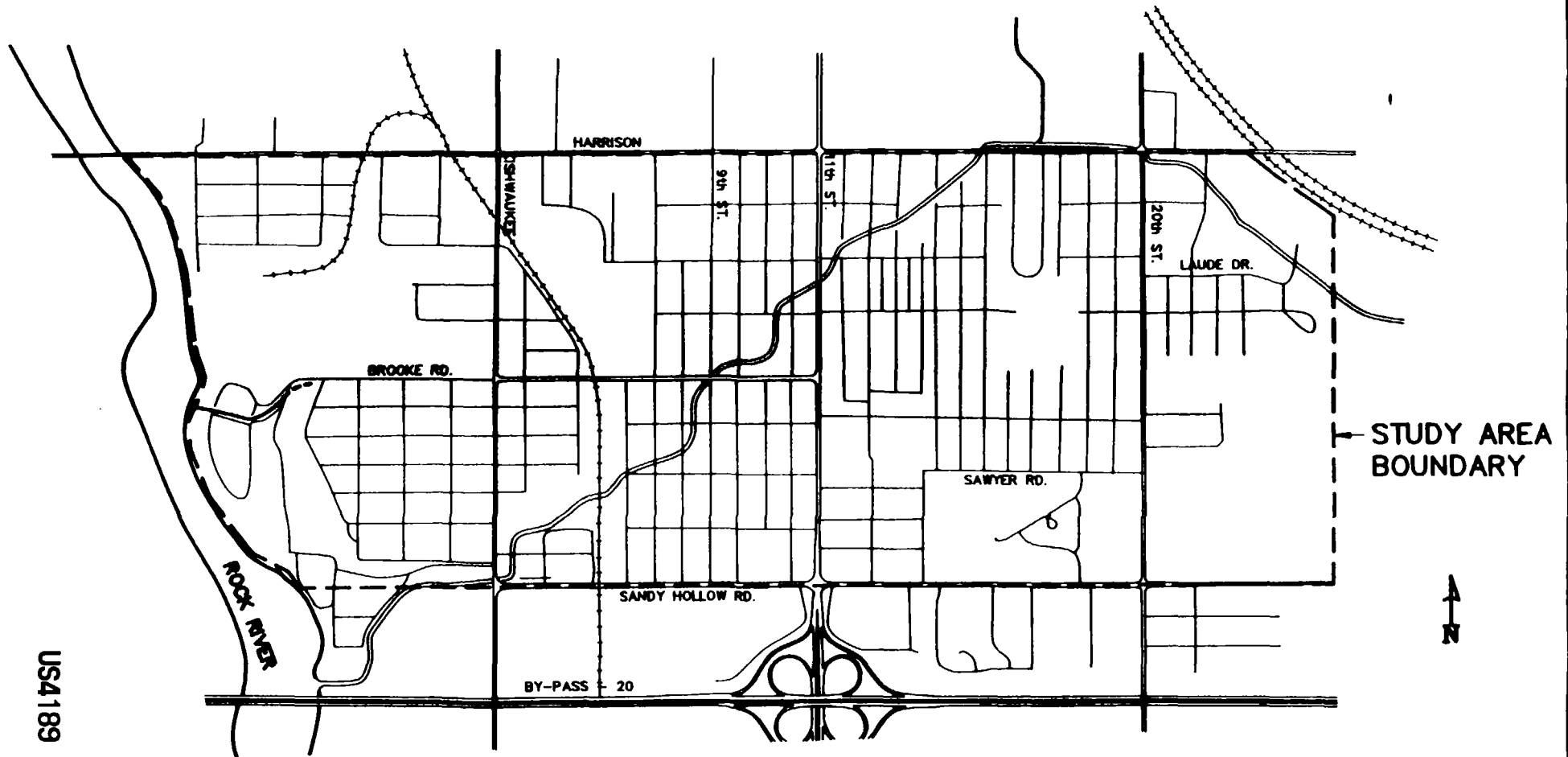
### 1.1 STUDY AREA LOCATION

The study area is located near Southeast Rockford in Winnebago County, and consists of approximately 2 to 3 square miles in Sections 1, 2, and 3, T43N, R1E and Section 6, T43N, R2E. The study area is bounded by Harrison Avenue to the north, Sandy Hollow Road to the south, the north-south center line of Section 6 to the east, and the Rock River to the west. The study area is shown in Figure 1-1.

The study area has been expanded westward and southward from the boundaries which were used to score the site for inclusion on the United States Environmental Protection Agency's (USEPA's) National Priorities List (NPL). The previous western boundary of the site was 8th Street, but the present study area extends west to the Rock River. The previous southern boundary was Sawyer Road, but the present study area extends south to Sandy Hollow Road.

### 1.2 STUDY AREA STATUS AND PROJECT TYPE

As a result of sampling events by state and federal agencies, the Southeast Rockford site was proposed for inclusion on the NPL in June 1988 and was added to the NPL in March 1989 as a state-lead, federally-funded Superfund site. The final removal action by USEPA includes extensions of water mains and providing hookups to city water for residences and private wells contaminated with volatile organic compounds (VOCs) at levels greater than



**CDM**

environmental engineers, scientists,  
planners, & management consultants

0 SCALE 0.5 MILES

**SOUTHEAST ROCKFORD  
STUDY AREA**

FIGURE NO.

1-1

25 percent of the Removal Action Limit (RAL). Pending final approval, USEPA expects to begin construction of the water main extensions and residential hookups in June 1990. In addition to this operable unit study, the Illinois Environmental Protection Agency (IEPA) is currently in the planning stage of a phased RI/FS to more accurately assess the status of groundwater contamination in the study area and to delineate potential source areas.

### 1.3 WORK PLAN OVERVIEW

To achieve the objectives of the operable unit RI/FS, the following tasks have been identified:

- o Compilation, evaluation, and analysis of information to determine the nature and extent of groundwater contamination;
- o Assisting IEPA in conducting a well survey within the study area to define sampling locations and further identify those residences not connected to city water;
- o Collection and analysis of groundwater samples necessary to determine the areas affected by the groundwater contamination;
- o Evaluation of the current risks to public health from the contaminated groundwater;
- o Preparation and submission of a Technical Memorandum discussing the results of the above tasks;
- o Development of a limited number of alternatives for an initial Operable Unit on the basis of providing safe drinking water for affected residents;
- o Screening of alternatives for feasibility and appropriateness;

- o Management and analysis of treatability studies required to evaluate the applicability of remedial technologies (if necessary);
- o Preparation of a detailed analysis of the alternatives that pass the initial feasibility and appropriateness screening;
- o Evaluation and recommendation of cost-effective alternatives;
- o Preparation and submission of a phased FS report discussing the results of the above tasks; and
- o Submission of monthly Technical Progress Reports and Financial Management Reports.

#### 1.4 SCOPE OF SAMPLING ACTIVITIES

The scope of sampling activities for the Operable Unit RI/FS includes the collection and analysis of 204 samples: 155 of these samples are investigative, 17 are field duplicates, 17 are field blanks, and 15 are trip blanks. Only potable drinking water samples from residential, municipal, and industrial wells will be collected. The sampling and analysis program, including parameters that will be analyzed for and the number of quality control samples, is summarized in Table 1-1.

TABLE 1-1  
SUMMARY OF SAMPLING AND ANALYSIS PROGRAM

Sample Matrix	Field Parameters	Laboratory Parameters	QA Samples									Matrix Total
			Investigative Samples			Field Duplicate			Field Blank			
			No.	Freq	Total	No.	Freq	Total	No.	Freq	Total	
Residential Wells	pH, Specific Conductance, Temperature	SAS for volatile <sup>1/</sup> organics from CLP	144	1	144	15	1	15	15	1	15	174
		SAS for metals <sup>1/</sup> from CLP	144	1	144	15	1	15	15	1	15	174
Municipal Supply Well	pH, Specific Conductance, Temperature	SAS for volatile <sup>1/</sup> organics from CLP	1	1	1	1	1	1	1	1	1	3
		SAS for metals <sup>1/</sup> from CLP	1	1	1	1	1	1	1	1	1	3
Industrial Wells	pH, Specific Conductance, Temperature	SAS for volatile <sup>1/</sup> organics from CLP	10	1	10	1	1	1	1	1	1	12
		SAS for metals <sup>1/</sup> from CLP	10	1	10	1	1	1	1	1	1	12

A trip blank will be included with each shipment of volatile organic samples. An estimated 15 trip blanks will be required.

One sample out of every 20 (or portion thereof) will be collected as a matrix spike duplicate sample.

<sup>1/</sup> Compounds to be analyzed for are specified in the SAS request appended to the Quality Assurance Project Plan.

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## 2.0 CURRENT STATUS OF STUDY AREA

Prior to planning the Operable Unit RI/FS, previous studies, available literature, and other pertinent information were reviewed. This section presents a summary of the review.

### 2.1 STUDY AREA DESCRIPTION

The study area is predominantly an urban residential area that includes scattered retail and commercial operations. A small industrial park is located near the eastern boundary of the study area in the vicinity of Laude Drive. The study area is predominantly flat-lying and slopes gently westward toward the Rock River, but locally contains low-relief hilly areas. Maximum topographic relief across the study area is approximately 120 feet. A small concrete-lined drainage ditch runs across the study area and discharges to the Rock River near the southwestern corner of the study area.

A review of 117 Illinois Department of Public Health (IDPH) well construction reports indicates that the majority of the residential wells in the study area are screened in the 40-foot to 70-foot depth range in a sand and gravel aquifer. Although deeper residential wells are common in the study area, no systematic distribution of the deeper wells is evident. The information contained in the IDPH well construction reports is insufficiently detailed to characterize the hydrogeology of the site or to determine the well construction parameters for each of the private wells that will be sampled as a part of the Operable Unit investigation. To compensate for this deficiency in available information, the samplers will attempt to ascertain details of well construction in the field by questioning residents and by direct observation. The detailed hydrogeology of the study area will be addressed in the phased RI/FS for the site, which is a separate study that is currently in the planning stage.

## 2.2 GEOLOGICAL SETTING

The Southeast Rockford study area is situated over a valley train deposit that unconformably overlies Ordovician-aged bedrock. The valley train deposits are a complex sedimentary assemblage of unconsolidated sands, gravels, silts, clays, and tills that were deposited on the margins of the ancestral Rock River during various glacial events. These deposits are laterally discontinuous with complex stratigraphic relationships. Within the study area, the valley train deposit thickens to the west. In the vicinity of Harrison and Horton, the unconsolidated sediments are approximately 84 to 93 feet thick. The municipal well 35 at Ken Rock playground (2944 Bildahl Street) has a depth to bedrock of 214 feet.

The unconsolidated valley train sediments overlie an eroded bedrock surface of the Galena-Platteville Dolomite, the Glenwood Formation, and the St. Peter Sandstone. The St. Peter Sandstone is a major aquifer in Illinois. The Galena-Plateville and the Glenwood Formation pinch out to the west, so that at the Rock River, the valley train deposits directly overlie the St. Peter Sandstone.

## 2.3 STUDY AREA HISTORY

Groundwater contamination by volatile organic compounds (VOCs) was initially discovered by the City of Rockford in 1981. Four municipal wells in Southeast Rockford were taken out of service in December 1981 as a result of the contamination. In 1982, the city discovered that additional wells were contaminated and closed down more city wells. Contamination of Municipal Well 35, located near Ken Rock Playground, was discovered during a routine sampling of the well in 1984; the well was tested for 33 priority pollutants and several VOCs were detected.

Because contaminants were present at levels above the Safe Drinking Water Act Maximum Contaminant Level (MCL), the well was taken out of service in

1985. Subsequent analysis of a sample from this municipal well after disinfection with chlorine in 1989 indicated that none of the original contaminants were present above the level of detection; however, the analysis did show the presence of several trihalomethanes at low levels. These compounds are commonly associated with water disinfection and are not attributable to the groundwater contamination problem in the area. Trihalomethanes are regulated under the Safe Drinking Water Act, but do not warrant concern for this study because they were detected at levels significantly lower than the MCL.

IEPA discovered that VOCs were present in Southeast Rockford's water in 1984 as a result of a report that plating wastes were being illegally disposed of in a well located at 2613 South 11th Street. In October 1984, IDPH initiated an investigation that involved sampling 49 wells in the vicinity of the well. While the investigation did not find significant levels of contaminants common to plating wastes, it did report high levels of chlorinated solvents. These same contaminants were detected in the City of Rockford's municipal well. Further investigation by IDPH indicated extensive contamination in the area. By 1986, IDPH was able to define the contaminated area as approximately 1.2 square miles in Southeast Rockford, (the original study area boundaries). IDPH conducted four separate sampling investigations involving residential wells in the Southeast Rockford area: 49 samples were collected in 1984, 43 samples in 1985, 17 in 1988, and 267 in 1989. For the most part, well locations sampled varied during the separate sampling investigations; however, in some cases, wells were sampled more than once.

Throughout 1989, the USEPA Technical Assistance Team (TAT) sampled residential wells in the Southeast Rockford area and tested for the following abbreviated list of VOCs:

- |                             |                                   |
|-----------------------------|-----------------------------------|
| o Trichloroethylene,        | o 1,1,1-Trichloroethane,          |
| o Cis-1,2-Dichloroethylene, | o Trans-1,2-Dichloroethylene, and |
| o 1,2-Dichloroethane,       | o 1,1-Dichloroethane.             |

Additionally, fourteen samples were also analyzed using gas chromatography/mass spectroscopy (GC/MS) for these compounds and 24 additional VOCs. This USEPA/TAT data correlates well with the full volatile scan IDPH data, indicating that the VOC contaminants of concern in the study area consist of chlorinated solvents as discussed in the next subsection.

To date, USEPA has initiated a removal action under which bottled water was offered as a temporary measure to residents whose well water analysis results revealed VOC levels greater than or equal to 25 percent of the RAL. In mid-December 1989, the wells in these residences were equipped with carbon filters as an intermediate solution to the problem. As discussed in Subsection 1.2, a more permanent solution is currently in the planning stage.

#### 2.4 CONTAMINATION ASSESSMENT

A number of contaminants have been detected in groundwater in the study area during IEPA, IDPH, and USEPA/TAT studies. The IDPH and USEPA/TAT sample analysis data are summarized in Tables 2-1 and 2-2.

In order to illustrate the approximate area affected by the plume of VOC-contaminated groundwater, a plume concentration map for TCE based on existing IDPH and USEPA/TAT data is included as Figure 2-1. Although the VOC plume contains other components in addition to TCE, TCE has been chosen as an indicator parameter to illustrate the general distribution of VOC-contaminated groundwater at the site. Review of USEPA/TAT data indicates that the other VOC contaminants in the study area have the same general distribution as the TCE plume shown in Figure 2-1.

Because IDPH has sampled the Southeast Rockford area extensively since 1984, the IDPH data set was considered along with the USEPA/TAT data set in determining the current concentrations of contaminants across the study area. Movement of contaminant plumes through the subsurface can cause concentrations measured at a single location such as a private well to

**Table 2-1**  
**Summary of Historical Sampling Results**

Source: IDPH

Year: 1989 (December)

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l)		MCL* (ug/l)	PRS*** (ug/l)	SAMPLES ≥ MCL		SAMPLES ≥ 50% MCL		SAMPLES ≥ PRS	
		Minimum	Maximum			#	%	#	%	#	%
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride	3\80										
Trichlorofluoromethane											
1,1-Dichloroethane	15\80	1	30	7	7	3	3.8%	6	7.5%	3	3.8%
1,1-Dichloroethane	21\80	1	78								
Trans-1,2-Dichloroethane	10\80										
Chloroform	8\80	1	5								
1,2-Dichloroethane	12\80	1	23	5	5	1	1.3%	3	3.8%	1	1.3%
1,1,1-Trichloroethane	40\80	ND	159	200		0	0.0%	3	3.8%		
Carbon Tetrachloride	2\80	2	27	5	5	1	1.3%	1	1.3%	1	1.3%
Bromodichloromethane	1\80	2	2								
1,1,2-Trichloroethane											
	42\80	ND	58	5	5	9	11.3%	12	15.0%	9	11.3%
Benzene	1\80	7	7	5	5	1	1.3%	1	1.3%	1	1.3%
Dibromochloromethane											
Bromoform											
1,1,2,2-Tetrachloroethane											
Toluene				2000**	2000						
Chlorobenzene											
Ethyl Benzene	1\80			700**	700						
Carbon Disulfide											
4-Methyl-2-Pentanone											
Ethynyl Benzene (Styrene)				100\5	100						
O-Xylene (1,2-Dimethylbenzene)											
m & p Xylene ( as m-Xylene)					10000						
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene	3\80	3	65								
Vinyl Chloride				2	2						
Tetrachloroethylene	39\80	ND	7	5**	5	1	1.3%	3	3.8%	1	1.3%

\*Safe Drinking Water Act Maximum Contaminant Level (MCL)

\*\*Proposed MCL (May, 1989)

\*\*\*Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)

Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.

ND=Nondetect

**Table 2-1**  
**Summary of Historical Sampling Results**

Source: IDPH

Year: 1989 (Pre-December)

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l)		MCL* (ug/l)	PRS*** (ug/l)	SAMPLES ≥ MCL		SAMPLES ≥ 50% MCL		SAMPLES ≥ PRS	
		Minimum	Maximum			#	%	#	%	#	%
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride	17\187										
Trichlorofluoromethane	2\187	2	19							1	
1,1-Dichloroethane	109\187	ND	63	7	7	43	23.0%	51	27.3%	43	23.0%
1,1-Dichloroethane	115\187	2	81								
Trans-1,2-Dichloroethane	12\187	1	12								
Chloroform	24\187	1	14								
1,2-Dichloroethane	25\187	ND	16	5	5	13	7.0%	17	9.1%	13	7.0%
1,1,1-Trichloroethane	164\187	1	436	200		28	15.0%	54	28.9%		
Carbon Tetrachloride				5	5						
Bromodichloromethane											
1,2-Dichloroethane											
Trans-1,2-Dichloroethane											
1,1,1,2-Tetrachloroethane	165\187	1	122	5	5	109	58.3%	119	63.6%	109	58.3%
Benzene	1\187	7	7	5	5						
Dibromochloromethane											
Bromoform											
1,1,2,2-Tetrachloroethane	16\187	2	74								
Toluene				2000**	2000						
Chlorobenzene											
Ethyl Benzene				700**	700						
Carbon Disulfide											
4-Methyl-2-Pentanone											
Ethynyl Benzene (Styrene)				100/5	100						
O-Xylene (1,2-Dimethylbenzene)											
m & p Xylene ( as m-Xylene)					10000						
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene	8\187	7	108								
Vinyl Chloride				2	2						
Tetrachloroethylene	113\187	ND	15	5**	5	9	4.8%	22	11.8%	9	4.8%

\*Safe Drinking Water Act Maximum Contaminant Level (MCL)

\*\*Proposed MCL (May, 1989)

\*\*\*Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)

Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.

ND=Nondetect

**Table 2-1**  
**Summary of Historical Sampling Results**

Source: IDPH  
Year: 1988

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l)		MCL* (ug/l)	PRS*** (ug/l)	SAMPLES ≥ MCL		SAMPLES ≥ 50% MCL		SAMPLES ≥ PRS	
		Minimum	Maximum			#	%	#	%	#	%
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride											
Trichlorofluoromethane											
1,1-Dichloroethane	8\17	ND	4	7	7	0	0.0%	1	5.9%	0	0.0%
1,1-Dichloroethane	8\17	ND	25								
Trans-1,2-Dichloroethane											
Chloroform	9\17	ND	7								
1,2-Dichloroethane	1\17			5	5						
1,1,1-Trichloroethane	13\17	2	140	200		0	0.0%	2	11.8%		
Carbon Tetrachloride	1\17			5	5						
Bromodichloromethane	1\17										
Trichloroethane	12\17	1	140	5	5	8	47.1%	10	58.8%	8	47.1%
Benzene				5	5						
Dibromochloromethane	1\17										
Bromoform											
1,1,2,2-Tetrachloroethane											
Toluene				2000**	2000						
Chlorobenzene											
Ethyl Benzene				700**	700						
Carbon Disulfide											
4-Methyl-2-Pentanone											
Ethynyl Benzene (Styrene)				100\5	100						
O-Xylene (1,2-Dimethylbenzene)											
m & p Xylene (as m-Xylene)					10000						
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene											
Vinyl Chloride				2	2						
Tetrachloroethylene	11\17	ND	14	5**	5	1	5.9%	6	35.3%	1	5.9%

\*Safe Drinking Water Act Maximum Contaminant Level (MCL)

\*\*Proposed MCL (May, 1989)

\*\*\*Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)

Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.

ND=Nondetect

**Table 2-1**  
**Summary of Historical Sampling Results**

Source: IDPH  
Year: 1985

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l)		MCL* (ug/l)	PRS*** (ug/l)	SAMPLES ≥ MCL		SAMPLES ≥ 50% MCL		SAMPLES ≥ PRS	
		Minimum	Maximum			#	%	#	%	#	%
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride											
Trichlorofluoromethane											
1,1-Dichloroethane	42/43	1	154	7	7	35	81.4%	38	88.4%	35	81.4%
1,1-Dichloroethane	39/43	1	64								
Trans-1,2-Dichloroethane	33/43	1	7								
Chloroform				5	5						
1,2-Dichloroethane	43/43	3	153	200		0	0.0%	10	23.3%		
1,1,1-Trichloroethane				5	5						
Carbon Tetrachloride											
Bromodichloromethane											
1,2-Dichloropropane											
1,1,2,2-Tetrachloroethane	41/43	1	88	5	5	33	76.7%	35	81.4%	33	76.7%
Benzene				5	5						
Dibromochloromethane											
Bromoform											
1,1,2,2-Tetrachloroethane				2000**	2000						
Toluene											
Chlorobenzene				700**	700						
Ethyl Benzene											
Carbon Disulfide											
4-Methyl-2-Pentanone				100\5	100						
Ethynyl Benzene (Styrene)					10000						
O-Xylene (1,2-Dimethylbenzene)											
m & p Xylene ( as m-Xylene)											
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene				2	2						
Vinyl Chloride	26/43	1	8	5**	5	3	7.0%	13	30.2%	3	7.0%
Tetrachloroethylene											

\* Safe Drinking Water Act Maximum Contaminant Level (MCL)

\*\*Proposed MCL (May, 1989)

\*\*\*Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)

Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.

ND=Nondetect



**Table 2-1**  
**Summary of Historical Sampling Results**

Source: IDPH  
Year: 1984

PARAMETER	# DETECTED/ # SAMPLED	RANGES (ug/l)		MCL* (ug/l)	PRS*** (ug/l)	SAMPLES ≥ MCL		SAMPLES ≥ 50% MCL		SAMPLES ≥ PRS	
		Minimum	Maximum			#	%	#	%	#	%
Chloromethane											
Bromoethane											
Chloroethane											
Methylene Chloride	2\49	3	9								
Trichlorofluoromethane											
1,1-Dichloroethane	46\49	2	236	7	7	39	79.6%	41	83.7%	39	79.6%
1,1-Dichloroethane	45\49	2	83								
Trans-1,2-Dichloroethane	31\49	1	3								
Chloroform	1\49	2	2								
1,2-Dichloroethane				5	5						
1,1,1-Trichloroethane	48\49	2	188	200		0	0.0%	6	12.2%		
Carbon Tetrachloride				5	5						
Bromochloromethane											
1,2-Dichloropropane											
1,1,2,2-Tetrachloroethane	45\49	1	45	5	5	34	69.4%	39	79.6%	34	69.4%
Benzene				5	5						
Dibromochloromethane											
Bromoform											
1,1,2,2-Tetrachloroethane											
Toluene				2000**	2000						
Chlorobenzene											
Ethyl Benzene				700**	700						
Carbon Disulfide											
4-Methyl-2-Pentanone											
Ethynyl Benzene (Styrene)				100\5	100						
O-Xylene (1,2-Dimethylbenzene)											
m & p Xylene (as m-Xylene)					10000						
2-Butanone (Methyl Ethyl Ketone)											
Cis-1,2-Dichloroethylene											
Vinyl Chloride				2	2						
Tetrachloroethylene	23\49	1	3	5**	5	0	0.0%	1	2.0%	0	0.0%

\*Safe Drinking Water Act Maximum Contaminant Level (MCL)

\*\*Proposed MCL (May, 1989)

\*\*\*Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)

Note: USEPA has proposed a dual MCL for Styrene. A single MCL will be selected after public comment.

ND=Nondetect

Source: USEPA/TAT  
Year: 1989

Table 2-2  
SUMMARY OF HISTORICAL SAMPLING RESULTS

GC-MS ANALYSIS

PARAMETER	#DETECTED/ #SAMPLED	RANGE DETECTED (µg/l)	MCL* (µg/l)	PRS*** (µg/l)	Samples ≥ MCL		Samples ≥ 50% MCL		Samples ≥ PRS	
					#	%	#	%	#	%
Benzene			5	5						
Bromoform	1\14	1.1								
Bromomethane										
Carbon Tetrachloride			5	5						
Chlorobenzene										
Chloroethane										
2-Chloroethylvinyl Ether										
Chloroform	7\14 (a)	3.4-8.3								
Chloromethane	1\14	2.9								
Dibromochloromethane										
Dichlorobromomethane										
1,1-Dichloroethane	11\14	1.9-320								
1,2-Dichloroethane	7\14	1.3-4.0	5	5			1	7.1%		
1,1,2-Trichloroethane	11\14	7.7-47.8	7	7	10	71.4%	10	71.4%	10	71.4%
1,2-Dichloroethylene	10\14	5.7-894								
Dichloromethane	2\14	1.8-2.1								
1,2-Dichloropropane	2\14		5**							
Cis-1,3-Dichloropropane										
Trans-1,3-Dichloropropane										
Ethylbenzene			700**	700						
Methylene Chloride	2\2 (b)	15.5-19.5								
1,1,2,2-Tetrachloroethane	1\14	1.9								
Tetrachloroethylene	6\14	.77-6.7	5**	5	2	14.3%	3	21.4%	2	14.3%
Toluene			2000**	2000						
1,1,1-Trichloroethane	11\14 (a)	2.1-245	200		3	21.4%	8	57.1%		
1,1,2 Trichloroethane	3\14	1.1-2.8								
Trichloroethylene	11\14	15.5-104	5	5	11	78.6%	11	78.6%	11	78.6%
Trichlorofluoromethane	1\14	3								
Vinyl Chloride			2	2						
m & p-Xylene (as m-Xylene)				10000						
o-Xylene										

\* Safe Drinking Water Act Maximum Contaminant Level (MCL)

\*\*Proposed MCL (May, 1989)

\*\*\*Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)

a=Results for this chemical for two of the fourteen samples are not legible. These are not included in the tabulation of the following columns.

b=Only two samples were tested for the presence of Methylene Chloride.

USA202

Table 2-2

Source: USEPA/TAT

Year: 1989

**SOUTHEAST ROCKFORD**  
**SUMMARY OF HISTORICAL SAMPLING RESULTS**

PARAMETER	# DETECTED/ # SAMPLED	RANGE DETECTED (µg/l )	MCL* (µg/l)	PRS*** (µg/l)	Samples ≥ MCL		Samples ≥ 50% MCL		Samples ≥ PRS	
					#	%	#	%	#	%
Trichloroethylene	97/113	.45-120	5	5	67	59.3%	76	67.3%	67	59.3%
1,1,1-Trichloroethane	97/113	.60-397	200	200	15	13.3%	35	31.0%	15	13.3%
Cis-1,2-Dichloroethylene	87/113	.58-323	70**	100	12	10.6%	29	25.7%	5	4.4%
Trans-1,2-Dichloroethylene	13/113	.57-2.5	100**	100	0	0.0%	0	0.0%	0	0.0%
1,2-Dichloroethane	37/113	.52-4.0	5	5	0	0.0%	6	5.3%	0	0.0%
1,1-Dichloroethane	85/113	.69-133	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

\*Safe Drinking Water Act Maximum Contaminant Level (MCL)

\*\*Proposed MCL (May, 1989)

\*\*\*Proposed Illinois Potable Resource Groundwater Quality Standards (PRS)

US4203

US4204



vary with time. To minimize any potential effects related to temporal variations in contaminant concentrations, only data since 1988 was evaluated for this study. The IDPH data covers a greater area and has greater spatial density than the USEPA/TAT data; therefore, the IDPH data was useful in defining the plume. Although the IDPH data was considered in defining the sampling points, variability in the data did not allow strict adherence to the IDPH data points in constructing contaminant concentration maps.

The VOCs that will be analyzed for the Operable Unit include the VOC contaminants of concern listed in Table 2-3. All of the contaminants of concern except vinyl chloride have been detected during previous groundwater studies in the Southeast Rockford study area. Vinyl chloride is a degradation product of several VOCs detected in groundwater samples in Southeast Rockford, and will be analyzed for because of its toxicity at low concentrations.

Metals have been analyzed in only a limited number of samples in the Southeast Rockford Operable Unit study area. Chromium was detected by IEPA in a 1984 investigation of illegal disposal of plating wastes in a well located at 2613 South 11th Street. Detailed information from this investigation is not available. Cadmium and lead were detected at levels in excess of the MCL in groundwater at Barrett's Mobile Home Park (located at Harrison and Marshall) in 1988 during a routine IEPA investigation of community water supply wells. Due to the limited extent of the inorganic data in the study area, all of the samples collected during the Operable Unit will be subjected to inorganic analysis for a list of target metals, which includes cadmium, chromium, arsenic and lead.

All groundwater samples for the Operable Unit will be analyzed using drinking water analytical methods to ensure comparability to the current applicable drinking water standards.

The following VOCs and metals have been identified as contaminants of concern based on frequency of detection, percent of samples exceeding MCLs or proposed MCLs, and chemical degradation relationships. The contaminants of concern and historical ranges of detection in the study area are listed in Table 2-3.

TABLE 2-3

<u>CONTAMINANTS OF CONCERN</u>	<u>RANGE (ug/l)</u>
Trichloroethylene (TCE)	ND to 140
1,1,1-Trichloroethane (1,1,1-TCA)	ND to 436
Cis-1,2-Dichloroethylene (cis-1,2-DCE)	ND to 323
1,1-Dichloroethylene (1,1-DCE)	ND to 63.4
Tetrachloroethylene (PCE)	ND to 15.1
1,2-Dichloroethane (1,2-DCA)	ND to 13.6
1,1-Dichloroethane (1,1-DCA)	ND to 320
Trans-1,2-Dichloroethylene (trans-1,2-DCE)	ND to 6.7
Vinyl Chloride	ND
Lead	11 to 31
Cadmium	5 to 14
Chromium	?*
Arsenic	ND to 10.5

ND = Not detected.

- \* Chromium was detected in groundwater at 2613 11th Street by IEPA in 1984. Chromium concentrations at this location are not known because sample analyses for this sampling event are not available.

(Note: Total 1,2-DCE was detected at 894 ppb at one residence sampled on 8/9/90 by USEPA/TAT)

### 3.0 OPERABLE UNIT REMEDIAL INVESTIGATION SCOPE OF WORK

#### 3.1 OBJECTIVES OF THE OPERABLE UNIT REMEDIAL INVESTIGATION/ FEASIBILITY STUDY

The objectives of the Operable Unit RI/FS are to determine which residences outside the Removal Action area are affected or potentially affected by the contaminant plume and to develop, evaluate, and identify the most cost-effective alternative for providing those residents a safe source of drinking water in a timely manner.

#### 3.2 DATA REQUIREMENTS

The following tasks have been identified for accomplishing the Operable Unit RI/FS objective.

- o Conducting two site visits to familiarize personnel with existing site conditions and to assist in selection of sampling locations.
- o Conducting a well survey to determine which residences within the study area are served by private wells and therefore potentially affected by the groundwater contamination. Sampling locations will be selected based upon this information.
- o Collecting groundwater samples from residential, industrial, and municipal supply wells within the study area to address data gaps remaining following previous sampling events by USEPA/TAT and IDPH; and
- o Conducting a limited Risk/Endangerment Assessment to evaluate the health risk to affected populations.

### 3.3 WELL SURVEY

To determine which residences outside the Removal Action area are served by private wells and therefore potentially affected by groundwater contamination, IEPA is conducting an ongoing survey of residents within the study area. Results of the survey have been used to establish sampling locations in the area north of Sawyer Road as discussed below in Subsection 3.4.

Significant data gaps that exist after the IEPA survey will be addressed in the field by a door-to-door survey which will be conducted by IEPA with the assistance of CDM.

### 3.4 RESIDENTIAL WELL SAMPLING

CDM proposes to collect 144 investigative samples (not including QA/QC samples) from residential wells in the study area to complement the USEPA/TAT and IDPH data and to more accurately define those residences affected by groundwater contamination. The principal objective of the sampling during the Operable Unit is to identify residential wells in the study area that 1) are contaminated at levels between the MCLs and the method detection limits for any contaminant; 2) are not currently served by municipal water; and 3) will not be served by the extended watermain to be installed by the USEPA. An additional objective of sampling is to maximize data coverage by avoiding resampling of residences that have been previously sampled. Therefore, the proposed sampling locations are concentrated outside of the known plume area (outside the 5 ppb contour for TCE) and in areas that were not sampled during previous studies or where previous sampling indicates variable contaminant concentrations. However, a small amount of resampling of residences previously sampled by IDPH (approximately 7 percent of the investigative samples) is proposed in order to assess plume movement, seasonal effects, and to verify comparability of data from the current study with data from previous studies.



IEPA has conducted a residential well survey to identify residents in the study area that may use private wells to obtain potable water. The survey was conducted by directly sending questionnaires to residents that may be affected by the groundwater contamination. The survey coverage is not complete; final survey results are not yet available for areas south of Sawyer Road, and no response to the survey has been obtained for about 25 percent of the residences in the area covered by the survey. The area south of Sawyer Road and the homes which did not respond to the survey are currently being addressed by IEPA by the ongoing residential well survey. The existing survey data is the most current and applicable data regarding existence of private water supply wells in the area, therefore the survey results were the primary resource used to determine proposed sample locations for the IEPA Operable Unit. The survey results as of April 4, 1990 were used to determine the sample locations.

In areas where the IEPA residential well survey did not provide information on the use of private wells, city of Rockford billing records supplied by Virginia Wood of IEPA were used to determine private well use. Because of known inaccuracies in the billing records, some sample locations in the area south of Sawyer Road were selected in areas where the billing records indicate that there may be no private wells, in order to achieve adequate sample coverage. In those areas, locations of private wells will be identified by the residential well survey currently being conducted by IEPA. Existence of private wells will be confirmed in the field prior to collecting samples.

A third source of information used in selecting sample locations was previous sampling events by IDPH and USEPA/TAT. Residences that have been sampled by USEPA were identified from chain-of-custody records and residences sampled by IDPH were identified from a database listing provided by Clay Simonson of IDPH. Residences that have been sampled since 1988 were avoided in the proposed sample locations. However, in order to assess data comparability and potential plume migration, an overlap of approximately 7 percent was allowed between residences previously sampled by IDPH in 1988 and 1989 and proposed sample locations.

Finally, the area within the plume as defined by the existing data, areas to be served by the USEPA Removal Action proposed water main, and residences previously sampled by USEPA have been excluded from the proposed sample locations. The area to be addressed by the Removal Action has been determined based on a map provided by Ken Theisen of USEPA.

Using these sources of information, a list of proposed sample locations was developed, which is included as Table 3-1. A map of proposed and existing sample locations is included as Plate A attached to the back cover of this document. Because of the inaccuracies inherent in the database regarding locations of private wells in the study area, these sampling locations should be considered tentative, and may be modified in the field depending on access, the presence of private wells, and other factors. Any remaining data gaps or inaccuracies in the proposed sampling locations will be addressed in the field by a door-to-door survey.

In order to achieve sample coverage in a cost-effective manner within the areas to be sampled, a total of 144 investigative sample locations are proposed, which will define the horizontal extent of groundwater contamination within a lateral resolution of one block or better. Because the depths of the screened intervals for private wells at the proposed sample locations are not known, it is not anticipated that the proposed samples will define vertical extent of groundwater contamination.

In the area west of 8th Street proposed sample locations were selected with a sample density of one sample per block. Because the residential well survey has not yet been completed, some proposed sample locations were chosen at residences where existence of a private well has not yet been confirmed. Consequently, it may be necessary to adjust these sample locations in the field. In this event, the target sample density of one sample per block will be maintained if possible. There is very little existing data in this area, therefore it is felt that a distribution of one sample per block is necessary to define the plume. This distribution also

**Table 3-1: SE Rockford Operable Unit  
Proposed Sample Locations**

<i>Street</i>	<i>Address</i>	<i>Street</i>	<i>Address</i>	<i>Street</i>	<i>Address</i>
4th	2805	11th	3015	Brooke	106
4th	2820	11th	3119	Brooke	202
4th	2917	11th	3208	Brooke	326
4th	3011	11th	3215	Brooke	411
4th	3045	11th	3301	Brooke	430
5th	2604	11th	3329	Brooke	613
7th	3115	15th	3135	Brooke	823
7th	3221	16th	3102	Brooke	914
7th	3305	16th	3122	Brooke	1101
7th	3337	17th	2602	Brooke	1202
8th	2914	17th	3120	Brooke	1317
8th	3009	17th	3141	Collins	2801
8th	3109	18th	3110	Collins	2825
8th	3138	19th	2622	Collins	3029
8th	3201	20th	2703	Collins	3109
8th	3237	20th	2717	Collins	3126
8th	3301	20th	3109	Collins	3245
8th	3337	Barnum	305	Collins	3310
9th	2624	Barnum	409	Fitch	407
9th	2730	Barnum	505	Fitch	507
9th	2808	Barnum	611	Fitch	601
9th	2842	Barnum	825	Fitch	807
9th	2927	Bildahl	3009	Grant	3045
9th	3102	Bildahl	3017	Grant	3107
9th	3210	Bildahl	3038	Hamilton	1735
9th	3245	Bildahl	3122	Harrison	733
10th	2627	Bildahl	3141	Harrison	1001
10th	3110	Bildahl	3206	Harrison	1713
11th	2613	Bildahl	3302	Harrison	1817
11th	2955	Bildahl	3338	Harrison	2315

**Table 3-1: SE Rockford Operable Unit  
Proposed Sample Locations**

<i>Street</i>	<i>Address</i>	<i>Street</i>	<i>Address</i>
Johnson	1737	Ranger	801
Kennon	315	River Blvd.	3007
Kennon	415	River Blvd.	3117
Kennon	517	River Blvd.	3125
Kennon	621	Rock Riv. Ave	508
Kishwaukee	3037	Roosevelt	843
Kishwaukee	3112	Sandy Hollow	728
Kishwaukee	3302	Sandy Hollow	826
Kishwaukee	3336	Sandy Hollow	1202
Lapey	3013	Sandy Hollow	1306
Lapey	3038	Sandy Hollow	1820
Lapey	3137	Saner	2905
Lapey	3213	Saner	3011
Lapey	3230	Saner	3110
Lapey	3325	Sawyer	319
Lindale	2406	Sawyer	407
Lindale	2620	Sawyer	525
Lindberg	2412	Sawyer	615
Lindberg	2619	Sewell	2622
Lyran	1616	Sewell	2646
Lyran	1701	Sewell	3137
Marshall	3125	South	527
Marshall	3137	South	619
Martin	430	Taft	801
Martin	508		
Martin	618		
Mattis	827		
Olsen	2812		
Pershing	1637		
Pershing	1726		

assumes that if water mains are installed in this area as part of the Operable Unit they will extend the entire length of the block because it will not be possible to determine any mid-block cutoffs with one sampling point per block.

In the area east of 8th Street, proposed sample locations were chosen by CDM in conjunction with IEPA and USEPA. For the purposes of this investigation, it has been assumed that existing USEPA/TAT and IDPH data adequately define the plume of VOC-contaminated groundwater at TCE concentrations greater than or equal to the MCL (5 ppb). All proposed sample locations have therefore been selected outside the 5 ppb TCE contour (Figure 2-1). The TCE plume was chosen to represent the extent of groundwater contamination by VOCs because the area represented by the plume of groundwater contaminated at levels exceeding the MCL for TCE encompasses all areas exceeding the MCL for the other VOCs detected at the site.

In those areas outside of the plume east of 8th Street, sample locations were selected based on existence of data gaps, presence of private wells, and previous sampling episodes. Within the constraints of these parameters, a sampling density of 1 to 2 samples per block was established as a goal, with the greater sample density concentrated near the margins of the plume. In this area it may be possible to have better lateral definition of the affected blocks by using a combination of existing and new data. This will be dependent on the degree of data comparability between the sampling events.

Figure 2-1 shows the approximate contour line for homes with TCE values below detection limits based on existing IDPH and USEPA/TAT data. This line should be considered approximate because the data collection dates extend over two years (1988 and 1989) and the detection limits and analytical methods used have not been defined. The area east of 11th Street has been more extensively sampled than that area between 8th and 11th Streets. Therefore, a distribution of approximately one residence per

block east of 11th Street and a distribution of two residences per block between 11th and 8th Streets were chosen based on the distribution of existing data. Sample locations have been selected both inside and outside the non-detect contour line. The sampling in areas outside the non-detect contour line is warranted in order to assess the extent of the metals contamination and to assess the cumulative health risks associated with the target volatile compounds (including TCE) that may be present at levels below the detection limits of the existing data.

### 3.5 INDUSTRIAL WELL SAMPLING

A review of aerial photographs indicates that there are approximately 26 sizeable industrial operations in the study area. Based on results of the response to the IEPA well survey, CDM will determine whether any of these industries are using groundwater as a potable water source. Only those industries using private wells for potable water will be sampled. It is anticipated that groundwater samples will be collected from a maximum of 10 industrial locations. Selection of industries to be sampled will be based on location with respect to the contaminant plume and accessibility of sampling, in addition to the requirement that the groundwater is used for potable water.

### 3.6 MUNICIPAL SUPPLY WELL SAMPLING

In addition to sampling residential and industrial wells, a sample from Municipal Supply Well 35, located at 2944 Bildahl, will be collected. This sampling will be conducted to provide information for subsequent FS tasks.

### 3.7 STORAGE AND DISPOSAL OF INVESTIGATION-GENERATED WASTES

Because sampling activities will be limited to the sampling of residential and drinking water wells, no liquid or solid hazardous wastes are expected to be generated.

### 3.8 DATA VALIDATION, ASSESSMENT, AND COMPILATION

Initial Contract Compliance Screening Level data validation will be conducted by the USEPA Contract Laboratory Program (CLP) to determine whether the data meets contract requirements as specified by the IFBs/SOWs for organic and inorganic analysis. The CDM data validation team will validate data received from the CLP to determine whether the data meets the requirements of the quality assurance project plan (QAPP). All data validation activities will be conducted in accordance with current USEPA guidance (i.e., USEPA's Laboratory Data Validation Functional Guidelines). Factors to be considered in data validation include sample holding times, instrument tuning and performance, instrument calibration, blanks, surrogate recoveries, matrix spike/matrix spike duplicate analysis, and other quality control parameters. The specifications provided in the guidelines and acceptance criteria given by the USEPA Central Regional Laboratory Quality Assurance Section will be followed when conducting data validation.

Data assessment will be conducted upon completion of data validation activities. The assessment will be based on new data and existing data determined to be consistent with the goals of the investigation. The data will be assessed based on usability for project objectives and will be summarized in a logical, usable format for data manipulation.

### 3.9 RISK ASSESSMENT

The Risk Assessment will be conducted to establish a baseline Public Health Assessment for the study area. The assessment will be limited in scope and will be developed in accordance with USEPA guidance documents, Risk Assessment Guidance for Superfund and the Human Health Evaluation Manual, and referenced documents therein. The manual guidelines will be modified as necessary to better suit IEPA's needs. Because this is an Operable Unit investigation with the sole objective of protecting human health with

respect to the study area drinking water, a full risk assessment as defined by CERCLA will not be necessary. The risk assessment to be performed during the phased RI/FS will address human health as well as environmental concerns. The results of the Operable Unit Risk Assessment will be included as a section in the RI Technical Memorandum.

The baseline evaluation will commence with input from the site investigation phases regarding chemicals, receptors, migration and exposure routes, and other site-specific factors. A limited list of indicator chemicals will be selected and their exposure concentrations to humans will be assessed. The assessment will include an estimation of human intake of the chemicals and characterization of human health risks for potential carcinogens and noncarcinogens. The evaluation for the Operable Unit will consist of the following tasks:

- o Obtaining receptor, chemical, and migration and exposure data collected during the RI;
- o Calculating indicator compounds and comparing to ARARs;
- o Documenting the analysis and submitting draft report of the findings to IEPA for review; and
- o Incorporating the final Risk Assessment as a section of the Technical Memorandum.

### 3.10 DRAFT AND FINAL REMEDIAL INVESTIGATION TECHNICAL MEMORANDUM

Following receipt of all analytical data, CDM will prepare a draft RI Technical Memorandum. The Technical Memorandum will summarize all site investigations and will be organized and presented in a manner showing the relationship between site investigations for each matrix. The Technical Memorandum will also be structured so that sample collection details and



respective analytical or measurement data can be easily cross-referenced. The general format the Technical Memorandum will follow is presented in Table 3-2. Subsections of the format that do not apply as a result of the Operable Unit will be so stated in the report and will not be addressed further.

The Technical Memorandum will also include the results of the Risk Assessment. The Risk Assessment will evaluate the no-action or other appropriate alternatives based on the actual or potential threat to public health. Actual or potential risks will be quantified whenever possible.

The draft Technical Memorandum will be submitted to IEPA and USEPA for review. Following transmittal of substantive comments compiled by the IEPA Project Manager, CDM will revise the report and submit a final report for approval. Upon approval, final copies of the Technical Memorandum will be printed and submitted to IEPA and USEPA for distribution to all involved parties. A total of 25 copies of the report will be prepared.

### 3.11 COMMUNITY RELATIONS

The community relations task is designed to assist IEPA in the planning and implementation of a site-specific community relations program for the Southeast Rockford study area.

Community relations support provided by CDM for the project may include the following subtasks at the request of IEPA:

- o Preparation of documentation, such as diagrams, plans, charts, etc.;
- o Assistance in preparation of responsiveness summaries;
- o Attendance and participation in public meetings;

**TABLE 3-2**  
**REMEDIAL INVESTIGATION**  
**TECHNICAL MEMORANDUM FORMAT**

**1.0 INTRODUCTION**

- 1.1 Purpose of Report
- 1.2 Report Organization

**2.0 STUDY AREA INVESTIGATION**

- 2.1 Includes description of field activities associated with site characterization. These may include physical and chemical monitoring of some, but not necessarily all, of the following:
  - 2.1.1 Geological Investigations
  - 2.1.2 Groundwater Investigations
  - 2.1.3 Human Population Surveys
  - 2.1.4 Ecological Investigations

**3.0 NATURE AND EXTENT OF CONTAMINATION**

- 3.1 Presents the results of site characterization of groundwater contamination

**4.0 BASELINE ENDANGERMENT ASSESSMENT**

- 4.1 Public Health Evaluation
  - 4.1.1 Exposure Assessment
  - 4.1.2 Toxicity Assessment
  - 4.1.3 Risk Characterization
- 4.2 Environmental Assessment

**5.0 SUMMARY AND CONCLUSIONS**

**APPENDICES**

- A. Analytical Data and QA/QC Evaluation Results
- B. Risk Assessment Methods

- o Preparation of meeting summaries and mailing lists; and
- o Other assistance as requested by IEPA.

### 3.12 CDM QUALITY ASSURANCE/QUALITY CONTROL MANAGEMENT

The Site Manager (SM) is responsible for overseeing overall RI activities and ensuring quality of work. The SM will review daily work assignments of project team members and will interject technical and managerial guidance as needed to increase the quality and minimize cost of work products. The SM is also responsible for ensuring that the specific requirements of the QAPP are satisfied during RI activities.

The SM will also coordinate with CDM's Quality Assurance Manager (QAM) to ensure that major deliverables and summary documents are reviewed by a team of QA reviewers for technical and management accuracy and completeness before submittal to USEPA.

### 3.13 PROJECT MANAGEMENT

Project management activities will play a key role in successful completion of the Operable Unit in the Southeast Rockford study area. Responsibilities of the CDM Project Manager throughout the Operable Unit will include the following:

- o Coordination with IEPA and USEPA to plan scoping and scheduling for the Operable Unit;
- o Assurance of timely completion of all scheduled activities;
- o Updating IEPA and USEPA on all project schedules;
- o Attendance at project review meetings and other meetings necessary to ensure normal progress of work;

- o Monitoring of any contractors/subcontractors;
- o Preparation of monthly progress reports of technical, schedule, and cost status; and
- o Evaluation of documentation and graphics for compliance with IEPA and USEPA standards.

The CDM Project Manager will prepare monthly project reports for submission to the IEPA site manager. These reports will discuss the technical progress of the project and the following items:

- o Identification of site and activity being discussed;
- o Status of work at the study area;
- o Percentage of completion and schedule status;
- o Difficulties encountered during the reporting period;
- o Actions being taken to rectify problems;
- o Activities planned for the following month;
- o Changes in personnel; and
- o Project cost status.

The monthly progress reports will list target and actual completion dates for each task activity, including project completion, and will explain any deviations that had occurred or are anticipated.

### 3.14 TECHNICAL AND FINANCIAL MANAGEMENT

The success of the Operable Unit RI/FS depends on sound project management. Both cost control and cost mitigation will be aspects of the project management function. Project management will focus on the following procedures to successfully complete the project:

- o Selecting, coordinating, and scheduling staff for task assignments;
- o Controlling budgets and schedules;
- o Establishing and maintaining project record keeping systems;
- o Producing and submitting required reports, including monthly financial and technical status reports and quarterly award fee performance event reports; and
- o Performing and coordinating quality control of all technical work.

Meetings will be held periodically with both USEPA and IEPA to discuss project status and address problem areas. Meetings will also be held between designated members of the team and experts in a particular discipline (e.g., hydrogeology, analytical services, quality assurance, etc.).

### 3.15 SUBCONTRACTOR PROCUREMENT

CDM will subcontract Tiller Consulting Group, Inc., of St. Louis, Missouri to conduct the Risk/Endangerment Assessment Task. No other subcontractors will be required during the Operable Unit. Because subcontracting tasks are estimated to be less than \$10,000, federal procurement procedures will not be required.

#### 4.0 FEASIBILITY STUDY

##### 4.1 GENERAL

The results of the Feasibility Study (FS) and subsequent Record of Decision will be used to support an Operable Unit for the Southeast Rockford study area. An Operable Unit is a discrete action that consists of an incremental step (or steps) toward a final remedy. Operable units may address geographic portions of a site, specific site problems, or other subcomponents of a total site contamination problem. For the Southeast Rockford project, the operable unit is intended to address the specific problem of the affected residents' contaminated water supply.

As such, the FS will be a focused effort to analyze a limited number of applicable alternatives, with the sole intent of establishing an alternative water supply. A comprehensive RI/FS for the study area is being conducted as a separate investigation.

##### 4.2 DATA COLLECTION

Relevant available data and reports will be collected and reviewed in order to develop an understanding of the physical setting and contamination problem in the study area and to provide a basis for developing and evaluating alternative water supplies. Any data gaps and inconsistencies will be identified and reported to IEPA. Major categories of information required to conduct the FS include the following:

- o Determination of the number, location, and potable water requirements of residences with private wells that a) have access to an existing municipal water main or b) do not have access to an existing water main;

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- o General well information for all City of Rockford municipal wells including pumping rates, capacity, construction details, usage, maintenance and rehabilitation records, and water quality;
- o Rockford water distribution system characteristics, including water main characteristics (e.g., diameters and materials), construction records, water pressures, water quality (hardness, etc.), layouts, and existing treatment facilities.
- o Available information regarding hydrogeologic characteristics including aquifer dimensions and yield, hydraulic parameters and boundaries, direction of groundwater flow, potentiometric surface, and aquifer water quality.

After the relevant data have been collected, reviewed, and evaluated, information and conclusions will be summarized and tabulated for ease of reference and inclusion into the final Operable Unit FS report.

During this task, the following agencies will be contacted to obtain information:

- o USEPA Region V;
- o IEPA;
- o Managers of the Rockford and other nearby community water departments;
- o ISWS;
- o IDPH; and
- o ISGS.

#### 4.3 ALTERNATIVES DEVELOPMENT

A limited number of alternatives for providing safe drinking water for affected residents will be developed based on results of the data collection task.

The following approach, in accordance with USEPA guidance documents, will be used in development of the alternatives.

##### Establishment of Operable Unit Response Objectives

Study-area specific objectives for the Operable Unit will be based on public health and environmental concerns and information gathered during data collection, and will be in accordance with the National Oil and Hazardous Substances Contingency Plan (NCP), USEPA interim guidance, and the requirements of any other applicable federal, state, or local statutes. Response objectives will be developed in close consultation with IEPA with oversight by USEPA.

##### Identification of Operable Unit Technologies

A limited number of appropriate technologies meeting the response objectives will be identified. Technologies that may prove extremely difficult to implement, not achieve the objective in a reasonable time, or rely on unproven technology will not be considered.

##### Identification of Alternatives

Alternatives will be identified and developed in close consultation with IEPA and the City of Rockford. The alternatives will incorporate the technologies, response objectives, and other appropriate considerations into a comprehensive, site-specific approach. Alternatives that feature the provision of a safe water supply will be emphasized.



Preliminary alternatives currently planned to be evaluated include the following:

- o No action;
- o Extending water mains and connecting affected residences to the City of Rockford water distribution system;
- o Constructing new residential water wells to withdraw groundwater from an uncontaminated water-bearing zone;
- o Treating contaminated groundwater at existing municipal supply wells; and
- o Installing point of use water treatment devices to reduce contaminant concentrations in existing groundwater.

This listing of preliminary alternatives has been developed with the assumption that an overall remedial action for the Southeast Rockford groundwater contamination condition at the Southeast Rockford study area will be further studied, analyzed, and implemented following the comprehensive RI/FS for the site, which is currently being conducted by IEPA through a separate contract with CDM.

The NCP requires that the no-action alternative be examined in detail to provide a baseline by which other alternatives can be evaluated. As a group, the preliminary alternatives feature relatively short implementation times, the ability to protect human health (by virtue of their ability to provide affected residences with potable water), and are all based on proven technologies. Additionally, the ability of the alternatives to meet the Operable Unit response objectives is somewhat independent of the amount of contamination present in existing residential well water. Because of these characteristics, and the amount of data currently available

concerning the target contaminants, the FS will not include a preliminary screening step normally conducted as part of larger, more complex studies and will proceed with detailed analysis of the preliminary alternatives, augmented by other alternatives if deemed necessary by IEPA.

As each alternative is analyzed, the following nine factors will be used as criteria for evaluation and comparison in subsequent tasks of the FS:

- o Protection of human health and the environment,
- o Short-term effectiveness,
- o Long-term effectiveness,
- o Reduction of toxicity, mobility, and volume of contaminants,
- o Implementability,
- o Cost,
- o Compliance with ARARs,
- o State acceptance, and
- o Community acceptance.

At the conclusion of this task, a brief alternatives array will be compiled, that will consist of preliminary technical descriptions and specific implementation considerations of each alternative. The alternatives array will be submitted to IEPA for review prior to conducting the detailed analysis of alternatives.

#### 4.4 DETAILED ANALYSIS OF ALTERNATIVES

The alternatives generated from the alternatives development task will then undergo detailed analysis according to the provisions of Section 121 of the Superfund Amendments and Reauthorization Act (SARA). This analysis will consist of four major elements: preparing a technical description, conducting an environmental assessment, evaluating institutional issues associated with implementation of the alternative, and comparing costs of the alternatives. Specific activities of the alternatives analysis are discussed as follows.

##### Technical Description

The technical description of each alternative will include the following:

- o Descriptions of appropriate treatment technologies (if applicable);
- o Discussions of special engineering considerations required to implement the alternative (e.g., any additional studies, changes in current water supply system operations, or construction required before proceeding with final design);
- o Identification of operation, maintenance, and monitoring requirements of the completed remedy;
- o Identification of safety requirements for remedial implementation, including both on-site and off-site health and safety considerations; and
- o An analysis of phasing the alternatives into operation either individually or in groups to produce significant environmental improvement or cost savings.

#### Environmental Assessment

An environmental assessment will be conducted that will evaluate each alternative's environmental effects, physical and legal constraints, and compliance with local, state, and federal regulatory requirements.

Where adverse environmental effects are identified, mitigation measures, if any, will be identified.

Each alternative will be assessed for its ability to protect or mitigate damage to public health based on the results of the Risk/Endangerment Assessment.

#### Cost Analysis

The present worth cost (using a 30-year life with a discount rate of 10 percent before taxes and after inflation [USEPA, 1985]) of implementing each alternative will be calculated. The present worth analysis will include capital costs and operation and maintenance costs associated with each alternative.

#### 4.5 LABORATORY AND BENCH SCALE STUDIES

For any remedial alternative in which a laboratory or bench scale treatability study is deemed appropriate, CDM will submit a separate work plan to IEPA for approval. Only after approval and authorization from IEPA will laboratory studies be conducted. The costs of laboratory studies are not included in this work plan.

#### 4.6 EVALUATION AND COMPARISON OF ALTERNATIVES AND RECOMMENDATION OF ALTERNATIVE

This task will consist of a comparative evaluation of the alternatives according to the nine criteria presented in Subsection 4.3.

Following the comparative evaluation of the alternatives, the one alternative that best satisfies the objectives of operable unit response in a cost effective manner will be identified and recommended.

#### 4.7 FEASIBILITY STUDY DRAFT AND FINAL REPORT

A draft FS report will be prepared for submittal to IEPA and USEPA and will include the findings of the FS tasks. The draft report will summarize data developed during the remedial alternatives assessment process. The project team will recommend an alternative or combination of alternatives for implementation to fulfill the operable unit response objectives. The recommended alternative shall be selected from among those alternatives that meet the following requirements:

- o The alternative shall be protective of human health and the environment; implementation of the alternative will meet or exceed ARARs or health-based levels established through a risk assessment when ARARs do not exist or when they are waived.
- o Unless the requirements are waived by IEPA, the alternative shall attain federal and state public health and environmental ARARs that have been identified for the specific site.
- o The alternative shall be cost-effective, accomplishing a level of protection that cannot be achieved by less costly methods.

An alternative may be selected that does not meet federal and state public health or environmental ARARs under the following circumstances.

- o The alternative is an interim remedy and will become part of a more comprehensive final remedy that will meet applicable or relevant and appropriate Federal and State requirements. (The Southeast Rockford Operable Unit response falls into this category.)

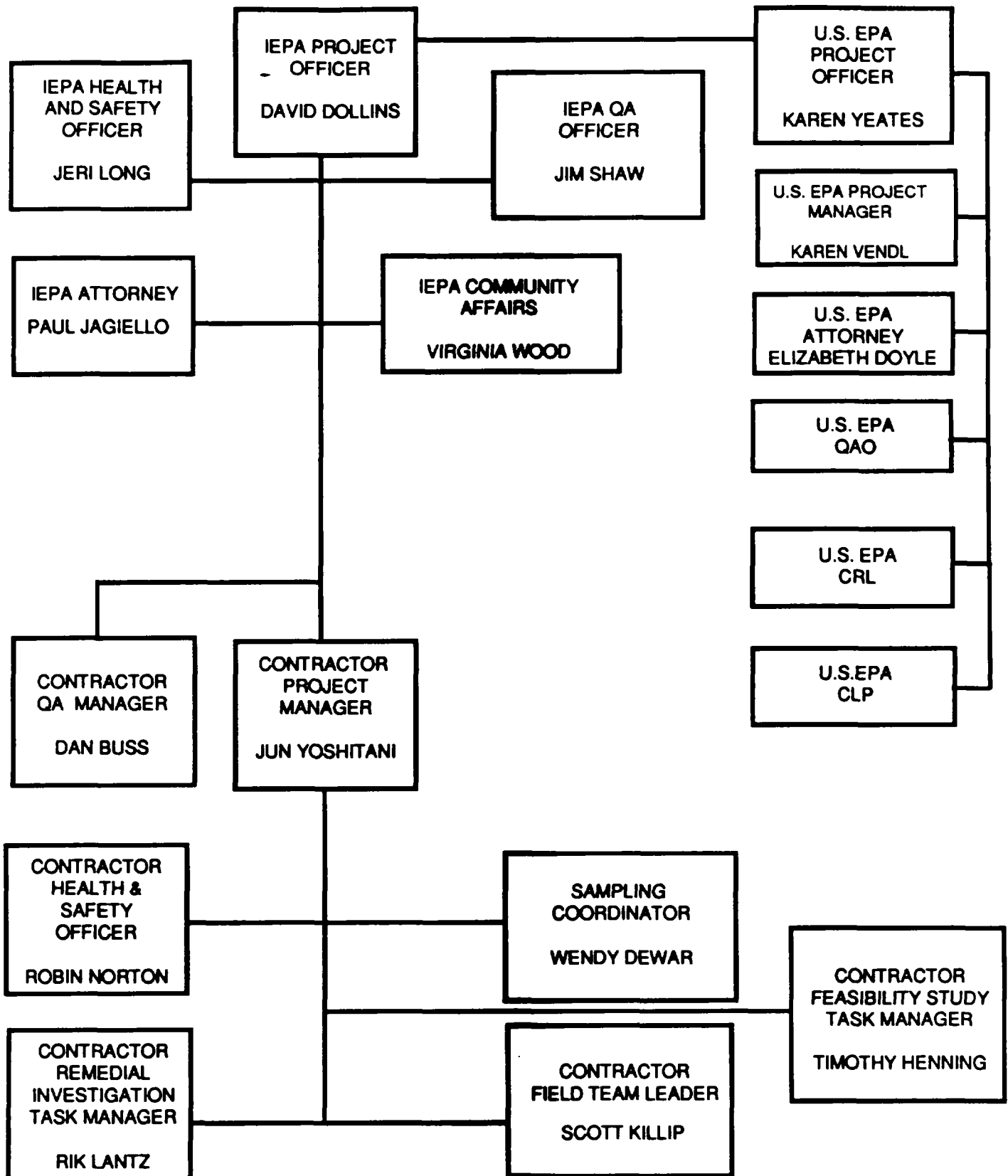
- o Compliance with the requirement will result in greater risk to human health and the environment than alternative options.
- o Compliance with the requirements is technically impracticable.
- o The alternative will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, or limitation through use of another method or approach.
- o The state has not consistently applied or demonstrated the intention to consistently apply the requirement for other remedial actions in the state.
- o The alternative will not provide a balance between the need for protection of human health and the environment at the site and the availability of fund monies to respond to other sites that may present a threat to human health and the environment.

A total of 20 copies of the draft FS report will be submitted to IEPA and five copies will be submitted to USEPA. CDM will revise the draft FS to consider and incorporate IEPA's and USEPA's comments as warranted. The draft FS for Public Comment will be adequate to support USEPA's needs throughout the public comment period during USEPA's development of the ROD.

## 5.0 PROJECT STAFFING

CDM has carefully selected the ~~members~~ of the project team to best match the skills of individuals to specific needs of the Southeast Rockford project. Personnel who have been assigned to the project, and their respective areas of responsibility, are shown in the organization chart in Figure 5-1. Community relations activities will be conducted by IEPA personnel.

# FIGURE 5-1 SOUTHEAST ROCKFORD OPERABLE UNIT ORGANIZATION CHART





## 6.0 PROJECT SCHEDULE

The schedule for conducting the Southeast Rockford Operable Unit activities is shown in Figure 6-1. The schedule illustrates the chronological coordination of tasks and is designed to ensure that project milestones specified in the revised statement of work are achieved.

**FIGURE 6-1**  
**SCHEDULE OF OPERABLE UNIT ACTIVITIES**

**Weeks From Date Of Project Plan Approval**

